PRACTICAL MANUAL

OF THE

TREATMENT OF CLUB-FOOT.

LEWIS A. SAYRE.

A PRACTICAL MANUAL

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TREATMENT OF CLUB-FOOT.

BY

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FOURTH EDITION, ENLARGED AND CORRECTED.

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72 FIFTH AVENUE.
1894.

DEDICATION.

To the Physicians and Students who have listened to my Lectures at Bellevue Hospital Medical College, and who have so repeatedly requested me to prepare for them a text-book on Orthopedic Surgery, this practical monograph on the treatment of Club-foot, as an instalment of the work which I hope soon to complete, is respectfully dedicated, by their sincere friend

THE AUTHOR.

PREFACE TO FOURTH EDITION.

A MORE extensive experience in the treatment of club-foot has proved that the doctrines taught in my first edition were correct, viz., that in all cases of congenital club-foot the treatment should commence at birth, as at that time there is generally no difficulty that cannot be overcome by the ordinary family physician; and that, by following the simple rules laid down in this volume, the great majority of cases can be relieved, and many even cured, without any operation or surgical interference. If this early treatment has been neglected, and the deformity has been permitted to increase by use of the foot in its abnormal position, surgical aid may be requisite to overcome the difficulty; and I have here endeavored to clearly lay down the rules that should govern the treatment of this class of cases.

LEWIS A. SAYRE, M. D.

285 FIFTH AVENUE, *May* 1, 1882.

PREFACE TO THIRD EDITION.

In issuing the third edition of my "Manual of Club-foot," I have inserted several new illustrations, which will make the text more clear, and have also added some new cases, illustrative of practical principles in treatment, as well as the latest improvements in the mechanical apparatus for perfecting my club-foot shoe, by the addition of a rotation power. Increased experience in the treatment of this class of deformities confirms the correctness of the principles laid down in my first edition. I have, therefore, no changes to make, other than the improvements suggested, for the purpose of carrying these principles into more easy and perfect application.

LEWIS A. SAYRE.

March 1, 1875.

PREFACE TO SECOND EDITION.

A VERY large experience in the treatment of deformed feet since the issue of the first edition of my "Manual," has practically proved the correctness of the principles therein inculcated.

The permanency of the cures, in the cases therein described, without having relapse of the deformity, is evidence of the superiority of the plan over those heretofore adopted.

Grateful to my professional brethren for their very flattering reception of my little work, I have felt it to be my duty, in issuing a second edition, to carefully revise the whole book. Many portions of it have, therefore, been entirely rewritten, and many parts have been illustrated with additional plates, to make the text more clear.

I have added a number of cases, which I think

will materially enhance its value, as indicating when to use the knife, and when you can expect to effect a cure without it.

My experience has enabled me, I think, to lay down certain fixed rules in all cases of deformity, as whether to *cut* or *not to* cut, for their relief; and this I consider a great point gained.

In all cases of club-foot, whether of paralytic or spastic origin, if the foot can be brought to its normal position by moderate traction without an anæsthetic, and, while retained there, additional pressure is made by the point of the finger or thumb on the tendon, or fascia, thus stretched, without producing reflex contractions, that deformity will not be benefited by tenotomy.

If, on the contrary, an anæsthetic is required before the deformity can be overcome, and while the patient is still under the influence of the anæsthetic, this additional, or point pressure, produces reflex contractions. Section of the tendon, or fascia, thus stretched, must be made before any attempt at treatment will be successful.

While some surgeons recommend the knife in every case, others refuse to cut in any. Both

classes are wrong, and it has been my endeavor to accurately point out the rules which should guide us in each different case, and thus avoid the errors of either extreme. How far I have succeeded in my effort, I must leave for the profession to determine.

LEWIS A. SAYRE.

New York, 285 Fifth Avenue, *July* 1, 1873.

PREFACE TO THE FIRST EDITION.

The necessity for a monograph illustrative of the recent advances in the proper treatment of club-foot, must be apparent to every candid observer. Within the past month I have known of three instances where the tendo achillis has been divided for a paralytic talipes varus, and in each case by gentlemen of the highest standing in our profession. No censure is here intended, for the gentlemen referred to but followed strictly the teachings of our standard authorities.

With the exception of Mr. Barwell's book on "Cure of Club-foot without Tenotomy," I know of no authority on the subject, except a short report which I presented to the American Medical Association at its last meeting in Washington City, advocating similar views to those here promulgated.

This report has been so favorably noticed by the medical journals—and I have received so many letters from physicians in different sections of the country, asking advice as to the treatment of club-foot—that I have deemed it my duty to put my views in such a form that the profession at large, as well as the students, could obtain them, inasmuch as the "Transactions of the Association" have only a limited circulation. This manual embodies all the principles contained in said report, and has been enlarged by the addition of notes taken of my lectures delivered at the Bellevue Hospital Medical College.

All the illustrations of cases are either from photographs, or from drawings taken from life by my assistant, Dr. L. M. Yale.

I have made no attempt to give an historical sketch of the different plans which have been suggested, or illustrations of the various instruments which have been devised for the relief of this deformity, as it would add materially to the expense of the work, without giving any satisfactory equivalent. As a man building a steamboat cares but little for the models employed by Fitch and Fulton in

their first experiments, but wishes to construct one on the most approved plan, with all the latest improvements, so the busy practitioner has no time or taste to investigate exploded theories, or study the mechanical construction of complicated instruments which have been proved to be useless, and therefore thrown aside.

My object has been to convey, in as concise a manner as possible, all the practical information and instruction necessary to enable the general practitioner to apply that plan of treatment which has been so successful in my own hands—without compelling him to send his cases to some specialist, or else be dependent upon some instrument-maker for expensive, complicated, and often useless mechanical apparatus.

If I shall have been successful in giving to my professional brethren this amount of useful information, I shall be more than amply rewarded for the labor of its preparation.

LEWIS A. SAYRE.

285 FIFTH AVENUE, *February*, 1869.

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TREATMENT OF CLUB-FOOT.

THE NORMAL FOOT.—The Human Foot, in its *natural* state, is one of the most beautiful examples of a complicated machine, combining great strength with graceful mobility, that can be found in any part of the human frame: consisting as it does of twelve bones (in addition to those of the toes), joined to each other by regularly-constructed articulations, admitting of motion to a greater or less degree between each individual bone—so that no restraint can be put upon these slight movements between the various bones without destroying the harmony of their combined action in the foot as a whole—and at the same time being so firmly bound together by ligaments, and sustained in position by tendons attached to strong muscles, as to give it an abundant security to bear the superincumbent weight of the body, while it allows of sufficient expansion and extension for ease and elasticity in locomotion.

It is connected to the leg at the astragalo-tibial articulation, and prevented from *any lateral* movement by the projecting malleoli on either side, which fit so closely to the sides of the astragalus as to permit of no motion at this joint, except that of flexion and extension, or that of pointing the toes up or down. Turning the toes out or in is produced by rotation of the thigh and leg at the hip-joint, or by the revolving motion of the fibula, produced by the contraction of the biceps and tensor vaginæ femoris, when the knee is flexed.[1]

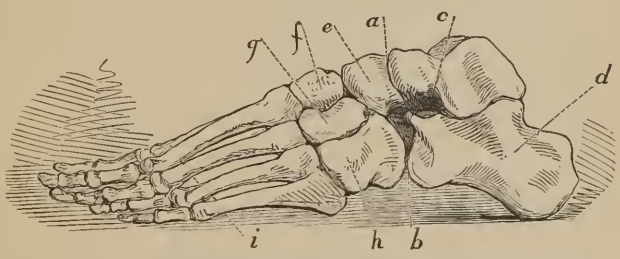
Having stated that no motion can occur at the tibio-tarsal, or ankle, joint, except *flexion* and *extension*, and that the pointing of the toes out or in is

[1] Prof. S. D. Gross, after thanking me for this work, which he states is "of great practical value to the profession," adds, in his letter: "I shall still continue to make *lateral* motion at my ankle-joint without rotating my hip or revolving the head of my fibula." So great a difference of opinion from such a distinguished authority made me, of course, exceedingly uneasy to think that I had been such a careless observer, and I therefore dissected a number of feet, both of children and adults, making most careful ligamentous preparations of each, and, after the most critical examination of all these specimens, I was unable to produce the slightest *lateral* movement in any of them. I therefore feel perfectly justified in asserting most positively the correctness of my first statement—that there is no *lateral* motion at the astragalo-tibial articulation. The lateral movement of the foot, which *appears* to take place at this joint, actually occurs at the junction of the os calcis with the astragalus, the latter bone being so firmly embraced by the external and internal malleolus as to permit of no lateral movement whatever.

done by the muscles of the hip, as above described, it follows, as a matter of course, that all the other motions of the foot, such as twisting the sole inward or outward, raising or depressing the arch, etc., must occur between the joints of the other eleven bones of the foot. The toes, being merely attachments, are not considered as having any influence in these motions.

If we carefully examine the foot, as seen in Fig. 1, we shall observe that, between the os calcis and astragalus behind, and the cuboid and scaphoid in front, is the *medio-tarsal* joint, *a*, *b*, going com-

FIG. 1.



a, *b*. The medio-tarsal articulation. *c*. The astragalus. *d*. The os calcis. *e*. The scaphoid. *f*. Middle cuneiform. *g*. External cuneiform. *h*. Cuboid. *i*. The metatarsal bones.

pletely across the foot, perfectly dividing it into an anterior and posterior portion, admitting in a limited degree of every variety of motion—flexion, extension, abduction, and adduction, as well as ro-

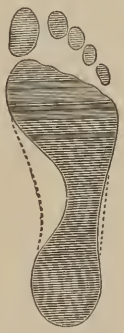
tation inward and outward upon the long axis of the foot. I desire to call particular attention to this compound articulation in the tarsus, because, by a most remarkable oversight of surgeons, the very important part which it plays in deformities of the feet has until very recently been entirely unnoticed.

The foot, as a means of support, rests upon three buttresses: the heel behind, which is stationary, and the first and fifth metatarso-phalangeal articulations in front, which are slightly movable, capable both of expanding and extending, thereby increasing the base of support, which adds to the security of the body, and by this very expansion and extension of the anterior pillars, or buttresses, gives elasticity in locomotion.

Between these three pillars, or points of base, spring two arches, one from the heel, reaching to the anterior two pillars, narrow behind, and wider in front, called the antero-posterior arch; and one from the two anterior pillars arching across the foot, called the transverse arch. The antero-posterior arch is higher on the inner than on the outer side, and cannot be brought to the ground in the normal condition of the foot, whereas the outer line of this arch is always brought to the ground whenever the weight of the body is borne upon it.

Let any one dip his naked foot in a pail of water, and then, while wet, stand with it upon a dry board or piece of brown paper, and he will get an exact impression of the parts of the foot which come in contact with the earth in supporting the weight of the body. (*See* Fig. 2.) It will be seen

Fig 2.



Impression of Natural Foot.

that the outer line of the arch touches its entire length, which thus gives it a firm and extensive base of support, whereas the inner line only touches the ground at its two extremities, the central part of the arch on the inner side being retained in position by the tibialus-anticus muscle, which is inserted into the inner and under surface of the internal cuneiform and base of the first metatarsal bones. It will, therefore, be seen that the strength and

perfection of this arch are greatly dependent upon the condition of the anterior tibial muscle. The importance of understanding the construction and retention of this arch will be more fully seen when we come to study the deformities of the foot, more particularly talipes valgus, or flat foot.

What is Talipes?—Under the name Talipes are included all deformities in which there is a permanent deviation from the normal relations of the foot to the leg, or of the parts composing the arch of the foot to each other, whether this deviation consist in flexion, extension, inversion, or eversion.

Four varieties are generally described, viz., Talipes equinus, T. calcaneus, T. varus, T. valgus.

Fig. 3.

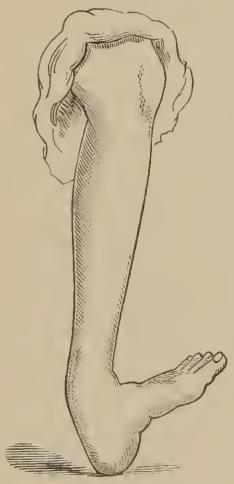
Talipes Equinus.

Talipes equinus receives its name from the position of the foot simulating the hoof of a horse, and

consists in the raising of the heel and dropping of the anterior portion of the foot, so that the weight of the body is borne upon the metatarso-phalangeal articulation alone, instead of upon the three points above spoken of. (*See* Fig. 3.)

Talipes calcaneus is that variety of deformity

Fig. 4.



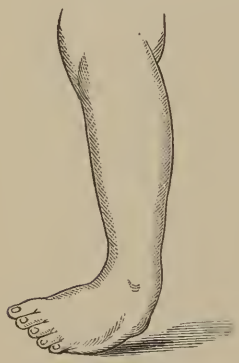
Talipes Calcaneus.

where the anterior portion of the foot is elevated, and the heel touches the ground. (*See* Fig. 4.)

In *talipes varus* the foot is inverted and more or less rotated, in such a manner as to bring its

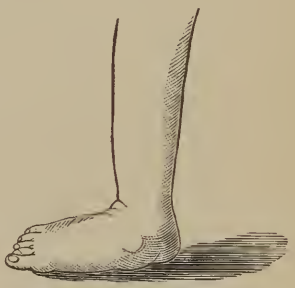
inner surface upward and the outer edge to a greater or less degree upon the ground. (*See* Fig. 5.)

Fig. 5.



Talipes Varus.

Fig. 6.



Talipes Valgus.

Talipes valgus presents the converse of this condition, the inner border of the foot being downward. (*See* Fig. 6.)

Typical examples of any of these varieties of talipes are rare, nearly always the deformity being a combination of two forms. Thus equinus may be combined with varus or with valgus, and the same is true of calcaneus. In designating such a deformity, the names of the two component distortions are combined, the more important being always placed first. Thus, when equinus and varus are united, it is styled equino-varus or varo-equinus, according as the equinus or varus is the more

prominent, and the same principle of nomenclature is used for calcaneo-varus and valgus.

In addition to the above-mentioned varieties, all of which may be congenital, there is another, *talipes cavus*, or *plantaris*, which, I think, is generally acquired, sometimes as the result of previous existing talipes of some other variety, or of some direct injury to the sole of the foot. It is a very frequent complication of other forms of talipes, and consists in a shortening of the plantar fascia, by which the heel and the ball of the foot are approximated and the arch exaggerated. When this exists as a complication, it is generally not mentioned in naming the deformity, which is called simply talipes varus, T. valgus, etc., as the case may be. When, however, as sometimes happens, the case presents no other deformity than is caused by the shortening of the plantar fascia, the name of talipes cavus or plantaris (hollow foot) is used. This variety is often mistaken for talipes equinus, and section of the tendo achillis accordingly practised. The result is by no means beneficial: the heel is simply dropped to correspond with the anterior part of the foot, and the arch becomes like an inverted U, a genuine *pes cavus*.

The deformity known as flat-foot, I think, should be considered as a variety of valgus, as the

peculiar breaking down of the arch is the same in both, and the two affections are very generally associated.

Causes of Talipes.—I do not propose to discuss at length the numerous remote causes which have been assigned for the existence of club-foot. I refer only to the immediate pathological change that brings about the deformity; and, for greater clearness, let us consider separately congenital and acquired deformities.

The congenital forms are all due to some interference, general or local, with the normal innervation of the part. So much has been generally accepted, but the real nature of this nervous disturbance has been for the most part misunderstood. The prevailing treatment of talipes is based upon the theory that the pathological condition is a spastic muscular contraction. The muscles at fault in any given case have been considered to be those that by contraction would draw the foot into the position which it occupies. Talipes equinus, is attributed to a spastic contraction of the gastrocnemius and soleus muscles; talipes calcaneus to the same condition of the anterior muscles of the leg. So in varus, the tibial muscles, and, in valgus, the peroneals and the extensor longus digitorum, have been considered to be the seat of disease.

The natural therapeutical inference from such a pathological theory was tenotomy, and it accordingly has become a *sine quâ non* of treatment.

Now experiment and observation have fully demonstrated that in the immense majority of cases the pathological change is precisely contrary to that which has been believed to exist. Spastic contraction is the exception, paralysis the rule. The muscles supposed to be in a state of spasm are really contracting with only their normal degree of force, which produces an excessive effect, simply because paralysis of the opposing muscles has destroyed the natural harmony of action which exists between the tractile forces which govern the motions of the foot. I have said paralysis is the lesion, as a rule; I believe, rather, that *all* cases of congenital talipes, *if examined immediately after birth*, would be found to be paralytic in their nature, and that the spasm, or contracture found to exist in some cases after a time, is really acquired, and due to irritation or inflammation of the muscles and fasciæ involved, which inflammation is the result of their abnormal position, and consequently secondary to their paralytic cause. Not that I would deny the possibility of such a spinal disease as should cause a tonic spasm of the muscles existing *in utero*. But if such cases do exist, they must be very rare, and, for myself, I have never seen them.

If any one doubts the paralytic nature of these congenital deformities, let him examine the first case he may meet within a few days after the birth of the child, and he cannot fail to mark the great ease with which the deformity can be reduced and the foot restored nearly or quite to its normal position, if he does not excite reflex contraction by too rapid and violent attempts at reduction.

What has been said above, of the lesion in congenital talipes, is to a great extent true of the acquired form. Acquired talipes very generally is due to the various kinds of "infantile paralysis," which are the frequent sequelæ of scarlatina, diphtheria, dentition, and many other diseases in which a blood-poisoning exists, or which are attended with great exhaustion. Very many of the cases of this sort give a history of paralysis that originally involved the whole of the lower extremities, and frequently the upper.

Some cases of acquired talipes, however, are not paralytic in their character: these are—occasional cases dependent upon diseases of the spinal cord, in which treatment can be of little use while the originating disease is uncured; cases following direct injury, which has caused inflammation and subsequent shortening and rigidity of muscles and fasciæ; and certain cases, in which acquired spastic deformities are added to the paralytic ones previously

existing. This last is a very common condition of things, and doubtless has been the chief cause in prolonging the belief in the spastic nature of most of these deformities.

To apply these principles to special varieties of talipes, we must look for the seat of the disease, *not* in the muscles on that side of the leg *toward* which, but on that *from* which, the foot is distorted. In equinus, instead of the gastrocnemius and soleus being spastically contracted, the anterior muscles of the leg, are paralyzed. The paralysis is often so extensive that the only muscle retaining contractility is the extensor proprius pollicis, which, acting alone, at length produces a subluxation of the great toe. (See Fig. 39). In calcaneus, the gastrocnemius and soleus are paralyzed; in varus, the peroneals chiefly; in valgus, the tibials and, perhaps, the long flexor.

The Seat of Talipes has always till recently been supposed to be at the ankle-joint. If the ideas expressed above, concerning the motion possible at the astragalo-tibial articulation, are correct, then the only forms of talipes that could concern the ankle-joint are those where the heel is raised or dropped, equinus and calcaneus. Examination of cases of, so called, equinus will satisfy any one that in them (with the exception of the few acquired cases having their origin in a traumatic contraction of the soleus and

gastrocnemius) the heel is little if at all removed from, and can easily be restored to, its normal relation to the axis of the limb, there being really a dropping of the anterior portion of the foot; and that, as in varus and valgus, the deformity takes place at the medio-tarsal junction. The deformity of calcaneus, which is dependent upon paralysis of the above-named muscles, does occur at the ankle-joint, and this I believe is the only variety of which this is true.

A further anatomical reason for the truth of this statement regarding the seat of the deformity is this: Of the twelve muscles of the leg which move the foot, nine, namely, the tibialis anticus, extensor proprius pollicis, extensor longus digitorum, peroneus tertius, flexor longus pollicis, flexor longus digitorum, tibialis posticus, peroneus longus, and peroneus brevis, have their insertion anterior to the medio-tarsal junction, and but three—the gastrocnemius, soleus, and plantaris—posterior to this articulation, these three muscles having a common insertion, by means of the tendo achillis, into the os calcis. It follows, as a matter of course, that any deformity, dependent upon a disease of these three muscles, must have its seat at the articulation moved by them, namely, the ankle and the calcaneo-astragaloid articulation, and that, if any of

the other nine muscles be affected, the resulting distortion will be anterior to the medio-tarsal junction.

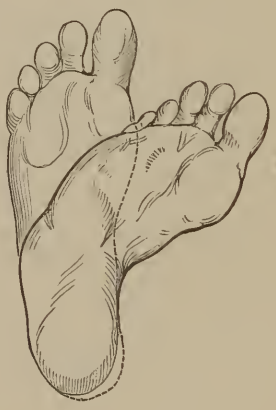
This inference, drawn from the anatomy of the foot, is practically confirmed by observation of cases. If the reader has not opportunity for clinical observation, let him study the cuts in this book. These cuts have not been made with any reference to the establishment of the theory enunciated, but have been drawn by the engraver from photographs or from plaster casts. It is a matter worthy of remark how flat a denial is given to the statements of many standard works upon orthopedic surgery by the cuts with which these very works are illustrated—the description being made to accord with a false theory, and the illustrations being copied from the really existing deformity.

The *vertical* displacement taking place at the medio-tarsal junction is shown in Fig. 33, which is a reduction from a tracing made by laying the foot upon a piece of paper and carefully carrying a lead pencil around its contour.

The *lateral* divergence is readily shown by tracing upon a piece of paper the outline of the sole of the first case of varus that presents itself, and comparing the tracing with that of the opposite foot, if it be sound, or with that of any normal

foot of similar size. You will find that the deformity does not consist in a twist at the ankle-joint, by which the toes are thrown inward and the heel outward, but that the flexion occurs at the arch of the foot. The heel and posterior part, about one-third of the deformed foot, will coincide with that of the normal one, while the anterior part turns suddenly inward at the middle of the tarsus. (See Fig. 7.)

Fig. 7.



The Resultant Complications of Talipes are: —the effects of inflammation or irritation; defective nutrition of the foot and leg; and the effects of pressure in changing the bony structure.

Inflammatory action is sometimes set up in the

muscles as the result of direct injury; this is very frequently the case with the fasciæ and integuments in the sole of the foot. The result in either case is a permanent shortening of these tissues, which become then one of the first obstacles to be overcome in the treatment. But *contracture* is produced in another way. The muscles that have remained sound, if unirritated, contract only with a normal degree of force; but a constant source of irritation is found in the malposition of the foot. Pressure being made in abnormal directions, and upon surfaces not prepared for its reception, especially if inflammation has heightened the sensibility, causes frequent reflex contractions of the muscles. *Contracture* is the physiological result of this *prolonged contraction.*

The effect of talipes, in preventing proper nutrition, is seen in the atrophy of the leg, or entire limb, the smaller size of the foot, as compared with its fellow, as well as its lowered temperature, and livid color. The atrophy of the leg is due to the paralysis of one set of muscles, and the gradual wasting of the sound ones, from want of the exercise necessary to keep them in proper condition. The same want of exercise will partly account for the arrest of growth in the foot, but mainly it depends upon the diminution of the supply of ar-

terial blood sent to the part, and the obstruction of the return of the venous blood, caused by the malposition of the vessels of the foot. A hose will carry water a given distance with a certain force applied, when the tube is straight and unobstructed; but the same hose, with the same amount of force, will carry the water a much shorter distance if the tube be bent at an acute angle, and particularly if these angles be increased in number. So an artery, supplying any part, will do it better when in its natural position than it can do when bent around a bone, or bent upon itself, which partially closes its calibre, and by abnormal pressure diminishes the amount of blood flowing through it, within a given space of time. The veins also, by this distorted position, are prevented from returning the blood as freely as natural, thus causing all deformed feet to present the blue and cold appearance spoken of above as so characteristic of them, which is the result of venous congestion.

Moreover, when the disease is allowed to continue till adult life, an actual deformity of the bones of the tarsus occurs. Not only is the normal relative position of the bones changed, but the long-continued pressure in the new position brings about, eventually, a change in their articular facets. The weight of the body upon these deformed feet ag-

gravates the deformity, till the foot becomes a misshapen mass, covered with callosities, and is sometimes quite inadequate to sustain the body without artificial assistance. Locomotion becomes laborious, painful, or even impossible. We sometimes meet adults, with deformity of so grave a character, as to make amputation and the use of artificial feet a beneficial change.

Whenever the deformity has proceeded to the degree of altering the shape of the bones, we can hardly hope for a perfect cure; for, however carefully and frequently the deformity be corrected, the bones cannot fail to return to the new articulations which have taken the place of the normal ones, if the artificial means of retention be removed.

Treatment.[1]—From the characteristics of talipes above given, namely, the malposition and defective nutrition of the foot, it follows that the prime indications for treatment will be:

1. To restore the foot to its normal position.

2. To assist the nutrition by all the means within our reach, such as heat, friction, passive motion, galvanism, injection of strychnine, etc.

Proper treatment should fulfil both these indi-

[1] Many of the cuts and several of the cases are extracted from a report presented by the author to the American Medical Association, May, 1868.

cations; many plans have been proposed that met only the former, and consequently the success attending them has been incomplete. The second can hardly be accomplished at all if the first be neglected.

Again, whatever be the treatment employed, it should *begin at birth*, if the disease be congenital, or directly upon the receipt of the injury, if acquired. Starting thus early, cure may confidently be expected, and generally is easily attained, if sufficient time be allowed. To this matter the adage, "Delays are dangerous," forcibly applies. Every month that treatment is neglected diminishes the chances of its success. In a case of congenital talipes, if the treatment be begun at birth, we may generally anticipate that, by the time the child is old enough to stand erect, the feet will be so nearly in the normal position that the attempts at walking shall complete the cure rather than, as would otherwise be the case, aggravate the deformity.

The most serious difficulties met with in the treatment of talipes arise from: 1. The advanced stage of fatty degeneration in the paralyzed muscles, due to prolonged neglect, and, 2. The effects of the inflammation excited in the muscles and fasciæ by the irritation of walking with the feet in a false position; both of which difficulties could be avoid-

ed, or greatly diminished, by earlier attention to the case.

This principle of early treatment appears to have been recognized by Hippocrates, who applied proper bandages immediately after birth, in cases of congenital talipes. Why this sound practice should ever have fallen into disuse, it is impossible to say; but certain it is, that it was neglected to such an extent that, in the surgical text-books of fifty years ago, the subject is hardly referred to (a slight mention in Bell's Surgery is the only reference that I can find in any of the books at my command, of that date); and, in practice, so little was done for the cure of club-foot, that within a quarter of a century it was extremely common to meet persons who had all their life endured this deformity, without ever having undergone any treatment for its relief.

Tenotomy.—From the publication of Stromeyer's work, in 1831, dates a new era. The operation of tenotomy, advocated by him, found many friends, and, from the surprising nature of its results, became rapidly popular. I am informed by Prof. A. C. Post that tenotomy was first performed in this country by Dr. Jas. H. Dickson, of North Carolina, who cut the tendo achillis, in the case of his brother, about 1835. It was, however,

brought into general use here by Dr. William Detmold, who had himself been a pupil of Dieffenbach and Stromeyer. The immense advantages which this plan of treatment possessed over the let-alone method for some time rendered the profession blind to the disadvantages attending it. After a time, however, surgeons noticed that all cases of club-foot were not cured by tenotomy, and many that had appeared to be cured afterward relapsed.

This failure was due in some cases to the neglect of proper after-treatment, but generally to the fact that the operation of tenotomy is based in many cases upon a false pathological theory, namely, that the deformity is due to a spastic contraction or ab normal shortening of the muscle, the tendon of which was to be cut.

If what has been stated above regarding the paralytic origin of most cases of club-foot is true, then the severing of the tendons of muscles still remaining sound is entirely irrational. The very best result that could be expected from the operation would be, that the muscular support of the foot being removed on all sides, gravity would throw it into a normal position. The disease which underlies the distortion, namely, the paralysis, has been untouched. And, if the tendon becomes firmly reunited, there is likely to be a complete relapse

of the deformity; if the union is incomplete, the foot hangs as helpless at the end of the leg as the flail of the thresher.

But, while I believe that, in cases of congenital or acquired paralytic talipes, if taken in hand early, tenotomy is very rarely, if ever, needed, cases frequently present themselves where from neglect, it is absolutely essential, as a preliminary measure to all other treatment. These cases are those in which the fasciæ have become contracted, or the muscles contractured. By *contractured* I mean a muscle that has undergone *structural* change, and cannot be stretched or lengthened without severing its fibres either by the knife or force.

Now, how is this contracture to be diagnosticated? By anæsthetizing the patient, and then attempting to reduce the deformity. If the contraction yields without the rupture of any of the tissues, the condition is one of simple contraction, and can be relieved without section. If, however, the deformity persists, contracture has taken place, and tenotomy or rupture of the shortened tissues is demanded.

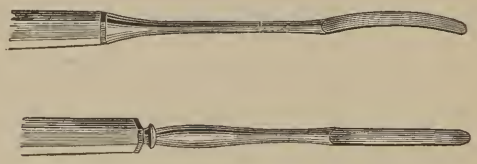
I have been obliged to cut the plantar fascia in a child of only fourteen months of age, that had walked but about two months, and whose history

showed that the contracture had taken place during the last-named period.

Having decided that tenotomy is required, *where* shall it be performed? While the patient is anæsthetized, put the parts under consideration upon the stretch to their fullest extent, and, while thus stretched, press with the finger or thumb upon the tendon or fascia thus stretched, and, if this additional pressure produces *reflex* contractions, that tendon or fascia must be divided, and the point of pressure producing spasm is the point for operation.

And, lastly, *how to cut.* In the first place, the tenotome should be properly made. Those which are found in the shops are nearly always too pointed. They puncture tissues that should be unmolested, and it is a very hazardous proceeding to use them in the neighborhood of important vessels. The danger from a punctured artery is too

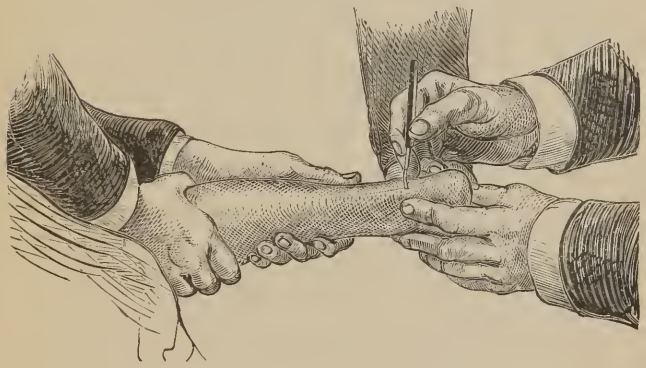
Fig. 8.



great to be risked. A properly-made tenotome is somewhat rounded upon the point, and sharpened

from side to side like a wedge or chisel, so that it rather splits than punctures the tissue through which it passes. (*See* Fig. 8.) Taking such a tenotome, hold it flatwise (*see* Fig. 9), and, while the assistant keeps the tendon or fascia to be cut upon the stretch, thrust it through the integument at an

Fig. 9.



angle so as to make a valvular incision, carry the point toward the tendon, and, when you feel the theca to yield, sink the blade under the tendon, turn its edge upward toward the tendon, and press the latter down upon the knife, which is kept in a short sawing motion until the tendon or fascia gives way, which it generally does with an audible snap. The blade is then turned back upon its side, and, as it is

withdrawn, pass your finger over the wound, assisting the escape of blood, but preventing the entrance of air, and afterward permanently close it with adhesive plaster. The foot is then covered with cotton and firmly bandaged as nearly as convenient in the natural position. The theca, though punctured, has been but little injured, and is a mould into which the material for the formation of a new tendon is effused. After a few days' rest, motion should be given to the tendon, to prevent its adhesion to the theca.

After division of any of the tendons or fascia for the relief of the different distortions of the foot, and closing of the wound in the manner which has been described above, bring the foot immediately into its natural position, or as nearly so as can be done, and retain it there by the following dressing:

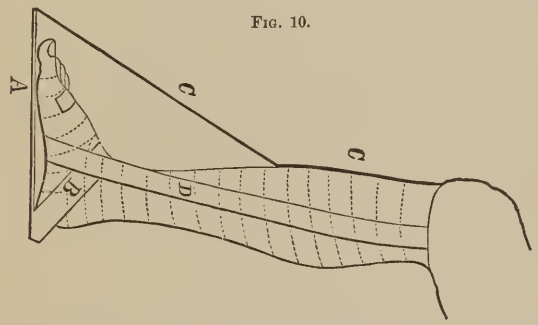
Cut a thin board (the top of a cigar-box answers very well) in the shape of the sole of the foot, which is to be dressed, only a little longer, and square at the toe. Then take a piece of strong "mole-skin adhesive plaster," as wide as the board, and long enough to cover both sides of the same, and to reach some inches above the knee.

Apply the adhesive side of the plaster to the board, commencing at the anterior extremity of the under surface, passing over to the posterior extremity

of the board, and under the same to its place of beginning; the remainder of the strip is subsequently to be applied to the anterior surface of the leg.

The foot is then placed on the board, *A*, and secured at the heel by a strip of the same adhesive plaster, *B*, passed over the ankle, and around the heel-part of the board, and additionally secured by a well-adjusted roller, which also extends above the ankle. The foot is now brought into its natural position, and the adhesive plaster, *C*, is firmly drawn up and secured to the leg by a continuation

FIG. 10.



A. The foot-board. *B*. Strap over ankle to fix board. *C*. Strap for flexion of foot. *D*. Strap for lateral fixation. The turns of the roller are dotted.

of the roller; the superfluous extremity is to be reversed, bringing its adhesive surface outward, and the roller, carried back over it, will be more firmly retained in position. In small children, with short limbs, you can carry it up on the thigh, for more secure and larger attachment.

If the foot has a tendency to valgus, another strip of plaster, *D*, is made to nearly encircle it, and is drawn upon the inner side of the leg to correct the deviation, and secured by a roller-bandage. (*See* Fig. 10.)

If the deformity is a varus, of course this last strip of plaster is applied in the opposite direction, and secured in the same manner.

I have found this simple dressing to answer much better than "Stomeyer's foot-board," or any other complicated form of apparatus that I formerly employed.

In a few instances where contraction of the sole existed (Cases VII. and X.), I have found that section of the plantar fascia was not sufficient to reduce the deformity. The integuments themselves had become so shortened that they would not yield, and their section was indispensable, and followed by a ready cure. I have seen the same condition to exist in long-standing deformities of other parts of the body.

Dr. Benjamin Lee, of Philadelphia, reported to the American Medical Association a case of severe talipes, of ten years' standing, in which he substituted *brisement forcé*, or forcible rupture of the contracted tissues, for tenotomy, the child being under chloroform. He says, in his report of the case:

"These manipulations were made with all the force I was capable of exerting, and were occasionally accompanied by the audible rupture of ligamentous or fascial fibres. They were repeated every third day for three weeks." It remains for further experience to determine whether, in cases demanding operative interference, rupture or section is preferable. I am unable to offer any opinion, as hitherto I have used only the knife, or at least have never used rupture alone.

I have, however, several times been obliged to force into place tarsal bones, which have become dislocated, or rather subluxated, by the long continuance of the deformity. The complication occurs most frequently, I think, in varus, the projecting points being the head of astragalus and anterior portion of calcaneum, and sometimes the cuboid bone. This condition existed in Cases X., XI., and XIII. The latter case, in particular, demanded so great an amount of force to accomplish the reduction, that I anticipated sloughing of the integuments. Fortunately this did not occur, the indurations and callosities about the part being doubtless a source of protection in this instance. It is well, if much force has been used in the reduction of the luxation of the bones, to institute some after-treatment, with a view to diminishing

the liability to inflammation; elevation of the limb, cold applications, a slight compression of the arteries, will be found most serviceable.

When the tenotomy and bandaging has thus as nearly as possible restored the deformity to the condition which existed before inflammatory action had taken place, the *treatment proper* can be applied just as if the case were one of uncomplicated congenital talipes.

The best means of cure would be the constant manipulation and retention of the foot in a proper position by the hand of an attendant. This, however, is unfortunately an impossible plan of treatment, although I have known cases in which a faithful nurse has very considerably diminished the deformity by constant handling. No instrument can ever have the delicate adjustment, the nice application of power, without doing injury, which the human hand possesses; and the degree to which any apparatus approximates the hand in these respects is the measure of its excellence.

Still, much can be done by the hand before the dressing, or instrument which may be selected, is applied, or during the intervals when it is removed for readjustment. The manipulation should be made in the following manner:

Take the foot in the hands and rub it gently with a shampooing motion. Hold it firmly in the

hands, and gradually press it as nearly as possible into its normal position. While this is being done, the foot becomes quite white. When the limit of the patient's endurance is reached, the foot should be allowed to fall back as it was before, and to rest for a few minutes. The operation should then be repeated, and after several repetitions it will be found that, with very little discomfort to the patient, the foot can be brought nearly, or quite, to its normal position. The manipulations should not be continued so long, or used with so much force, as to excite inflammation, or reflex contraction.

The shampooing friction of the muscles should be very thoroughly applied, and, in addition, they should be lightly whipped with the fingers transversely to their fibres. If a muscle is struck so that the blow falls in the direction of the fibres, the contraction produced is far less than if the blow be received transversely; the object being to awaken the paralyzed muscles to action, the latter method is far preferable. These manipulations, by drawing a large supply of blood to the part, very much increase its nutrition. They should be repeated daily, if possible; and I consider them of so much importance that I greatly prefer those forms of dressing which do not interfere with these and other kinds of accessory treatment.

Methods of Dressing.—To describe in detail the various plans which have been suggested would occupy too much time. I shall mention only the principal ones, which are really valuable, and, as briefly and clearly as possible, point out the indications for and objections to each.

The simplest of all is the ordinary *roller-bandage.* If the patient be taken while the case is yet recent, by bringing the foot as near its proper position as possible, and carefully bandaging it to retain it there, and by constant observation and readjustment of the dressing, a cure may sometimes be effected. There are very considerable objections to this plan of treatment, viz.: it is applicable to a very limited number of cases; it is very liable to get out of order, and therefore demands constant care; it has, moreover, an objection, in common with all which permanently cover the limbs by bandages, or splints, that it interferes with the necessary application of frictions and galvanism.

The *gypsum bandage* possesses the advantage over the last plan that it does not change its form; the limb is as securely locked as in a vice. In the details of its application, quite a considerable variety exists. [Some preferring to first bandage the limb, and then to cover the bandage with the gyp-

sum mixed with water; others, to fill the meshes of a loosely-woven cotton roller bandage with the dry powder, and to moisten it after it has been applied; and others, again, to make from woollen or cotton cloth a covering to fit the leg, and to apply to this the plaster.] These varieties are, however, immaterial; the property which gypsum possesses of "setting" when wetted, is the essential one to bring into operation. The objections to this plan are, the weight of the dressing, the impossibility of inspecting the limb, and of applying to it friction, electricity, etc., as before mentioned.

Again, *splints of sole-leather* and *gutta-percha* have been recommended as a plan of treatment. A pattern is fitted to the limb held in the position desired. The leather or gutta-percha is softened by immersion in water (if the former is used, cold water is necessary, as hot water shrivels it; if the latter, boiling water is necessary to warm the material); it is then moulded to the foot. After which the foot is gradually and slowly forced around into its natural position, and firmly held there while the leg part of the splint is moulded to the limb above and secured by the continuation of the roller, and carefully held in the required position until the splint is hardened.

Leather is to be preferred to gutta-percha, owing to its greater cleanliness and accessibility. Both leather and gutta-percha are superior to gypsum, in that they can be daily removed for personal inspection, manipulation, friction, shampooing, and electricity.

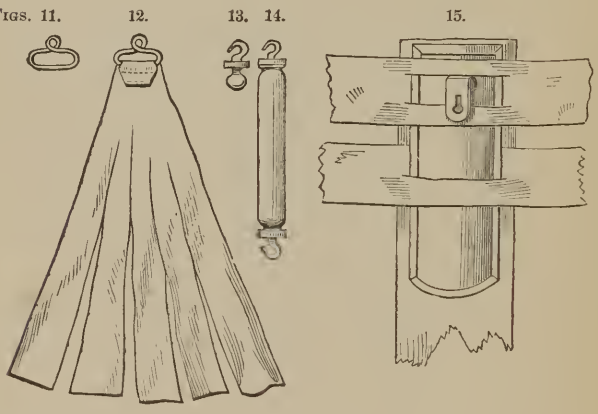
Before applying any of the bandages or dressings above described, the limb should be enveloped in cotton, or, what is better, wool (the advantage of the wool is its elasticity, which prevents its becoming compressed or irritating to the skin, while it seems to be rendered foul by the perspiration no more quickly than the cotton); this prevents the permanent dressing from excoriating or unduly constricting the limb at any point. Great care should be taken that no foreign matter be entangled in the fibres of the cotton or bandages, as very severe excoriations and ulcerations are produced by them. I have been obliged to suspend treatment owing to a grain of sand in cotton. The small shells found in compressed sponge sometimes cause the same trouble.

A large majority of congenital deformities, if taken *immediately* after birth, can be easily retained by the simple application of *adhesive plaster*. This can be applied in the following manner:

Cut a piece of strong adhesive plaster (Maw's mole-skin is the best), from two to four inches in width, and of sufficient length to go nearly around the foot, and to extend up some inches longer than the leg. Commence on the dorsum of the foot with one extremity of the plaster at a slightly oblique angle and wind it around the sole smoothly in the direction in which the foot is to be drawn; then with the hand draw the foot as near as possible to the natural position, and carry the plaster up the leg and secure it by a well-adjusted roller to the head of the tibia; as the plaster was cut longer than the leg, the end can then be reversed with the plaster outside, over which the roller is again carried down the limb, and the plaster will thus prevent it from slipping. Care must be taken not to have the plaster completely encircle the foot, and a few nicks cut in the edge nearest the ankle may be necessary to prevent strangulation of the circulation.

Although this plan is frequently successful, cases do occur in which the muscular rigidity is too great to yield to manipulation, unless continued for a longer time than can be generally given. A constant tractile force then becomes necessary, and the plan suggested by Mr. Richard Barwell, of London, is by far the best.

This consists in cutting from stout adhesive plaster spread on Canton flannel (the best I have seen is that styled "mole-skin plaster," made by Mr. Maw, 11 Aldersgate Street, London), a fan-shaped piece. In this, cut several slits, converging toward the apex of the piece, for its better adaptation to the part. (*See* Fig. 12.) The apex of the triangle is passed through a wire loop with a ring in the top (Figs. 11



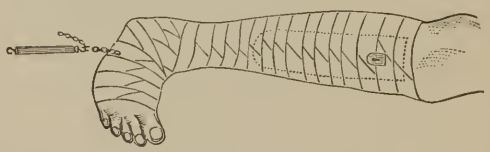
and 12), brought back on itself, and secured by sewing. The plaster is firmly secured to the foot in such a manner that the wire eye shall be at a point where we wish to imitate the *insertion* of the muscle, and that it shall draw evenly on all parts of

the foot when the traction is applied. Secure this by other adhesive straps, and a smoothly-adjusted roller.

The artificial *origin* of the muscle is made as follows: Cut a strip of tin or zinc plate, in length about two-thirds that of the tibia, and in width one-quarter the circumference of the limb (Fig. 15). This is shaped to fit the limb, as well as can conveniently be done. About an inch from the upper end, fasten an eye of wire. Care should be taken not to have this too large, as it would not confine the rubber to a fixed point. The tin is secured upon the limb in the following manner: From the stout plaster above mentioned cut two strips long enough to encircle the limb, and in the middle of each make two slits just large enough to admit the tin, which will prevent any lateral motion (Fig. 15): then cut a strip of plaster, rather more than twice as long as the tin, and a little wider; apply this smoothly to the side of the leg on which the traction is to be made, beginning as high up as the tuberosity of the tibia. Lay upon it the tin, placing the upper end level with that of the plaster (Fig. 15). Secure this by passing the two strips above mentioned around the limb (Fig. 18); then turn the vertical strip of plaster upward upon the tin. A slit should be made in the plaster

where it passes over the eye, in order that the latter may protrude. The roller should then be continued smoothly up the limb to the top of the tin. (*See* Fig. 16.) The plaster is again reversed, and brought down over the roller, another slit being made for

Fig. 16.



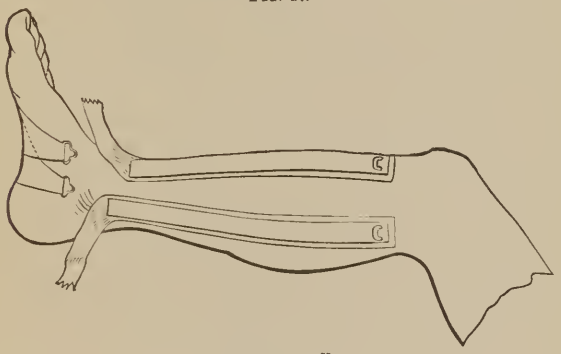
the eye, and the whole secured by a few turns of the roller. A small chain, a few inches in length, containing a dozen or twenty links, for graduating the adjustment, is then secured to the eye in the tin.

Into either end of a piece of ordinary India-rubber tubing, about one-quarter of an inch in diameter, and two to six inches in length, hooks of the pattern here exhibited (Fig. 13) are fastened by a wire or other strong ligature. One hook (Fig. 14) is fastened to the wire loop on the plaster on the foot, and the other to the chain above mentioned, the various links making the necessary changes in the adjustment.

The dressing, when complete, is shown in Fig. 27.

The constant traction of this rubber tubing is sufficient to overcome the strongest muscles, if they have not already undergone structural changes,[1] *i. e.*, if they have not become contractured (permanently shortened); or if fasciæ have not become contracted as the result of inflammation.

Fig. 17.



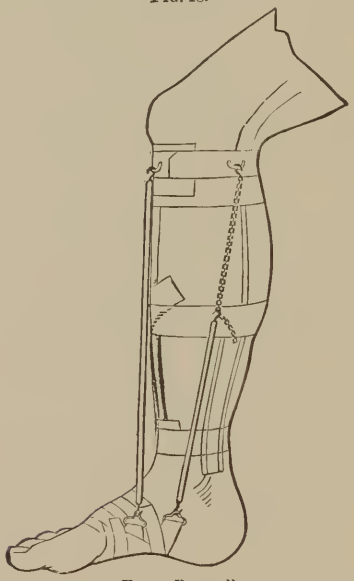
From Barwell.

The advantage of this plan of treatment over any of the others proposed, where the limb is forced into its position, and there securely fixed by the retaining apparatus (whether it be plaster of Paris, or complicated machinery, with screws and cogs, and which can only be altered by the key of the attendant), is, that this is an imitation of the natural

[1] If the rubber tubing is not stretched beyond six times its length, it will continue to contract to its original length for an indefinite period of time.

action of the parts, permitting and promoting the constant movement of the muscles and joints, thereby increasing the circulation in the same, and necessarily improving their development and power.

Fig. 18.



From Barwell.

The permanent fixing of any limb or joint in a stationary apparatus, thus preventing even the healthy muscles from contraction and relaxation, will sooner or later cause even these muscles to become atrophied, and undergo fatty degeneration; and certainly this plan of treatment could never

have a tendency to develop the latent power of a partially paralyzed muscle.

I cannot too frequently urge the necessity of motion as a means of permanent cure, or too strongly deprecate the use for any length of time of any form of appliance which shall prevent or materially limit the proper movements of the foot. Without motion, the muscles cannot be restored to their normal degree of development, and consequently the talipes will be cured only in form, and not in reality, and relapse will be the natural sequence of such incomplete treatment. Motion is the essential element of cure; and I think the chief value of galvanism and faradism, as promoters of muscular growth, lies in the muscular contractions which they produce. The growth is the result of action.

By the application of the elastic rubber, or contracting force, in just such a degree of strength as shall overcome the distorting muscles only, after a tension on them for a short time, in order to produce fatigue, and as shall not prevent them from contracting by an effort of the will, and thus redistorting the part, a constant motion is produced in the deformed and partially paralyzed limb, similar to that which occurs in the act of walking, and which will materially assist the circulation, and

raise the temperature of the part, and which manifestly has a tendency to improve its nutrition and increase its power.

The exact amount of force applied can be regulated at will by means of the chain attached to the tubing. The change of the hook from one link to another increases or decreases the power according as the length of the chain and tubing is diminished or increased. A very little practical experience will soon indicate the amount of force required in each case.

The only objection that can be brought to this plan of treatment is, that the adhesive plaster will sometimes slide and change its position; will soon become worn out, and require frequent readjustments; and, what is the most annoying, will often, particularly in very young children, and in hot weather, so irritate and excoriate the skin as to compel, for a while, the abandonment of its application.

To overcome or remedy this defect, I in 1867 constructed a club-foot shoe, on the general plan of the "Scarpa's Shoe," with a lateral hinge in the sole, for cases of valgus and varus; the only difference being that the motive power was the rubber tubing in place of the ordinary different kinds of springs which had formerly been used for this purpose.

As all distortions of the valgus and varus varieties involve the medio-tarsal articulation, no shoe is applicable for their treatment that has not a joint in the sole opposite this articulation, and any shoe for the treatment of these varieties of club-foot that has a solid or immovable sole, is not constructed upon physiological principles, and is therefore worse than useless.

This shoe was constructed in December, 1867, for a little child four years of age, that had been subjected to tenotomy several times, and had worn, almost since birth, heavy instruments of various kinds, only omitting them when the ulcers and excoriations were so great that danger was apprehended from continued pressure. None of the shoes that she had worn had been constructed upon correct principles; viz., that of *imitating natural movements*, and the pair she had on at the time I first saw her had neither motion in the soles nor at the ankles—in fact, were simple straight bars of steel, bolted at right angles to steel soles; and into these prisons the doctor had endeavored to force and secure the feet by straps and bandages in different directions, but the pain was so great as to require changes every few hours, and frequently he had been compelled to omit the treatment for several days together, in order that the skin might heal.

And yet these shoes had been contrived and applied by a gentleman of very great reputation in orthopedic surgery.

Even when the bandages were adjusted most carefully, the child could only walk in an awkward manner, on the outer edge of the soles, being unable to balance herself unless held by an assistant, no motion whatever taking place at the ankles or any of the joints of the feet.

The father of the child, a very intelligent physician, kindly permitted me to exhibit the case to my class at Bellevue Hospital Medical College, as I was lecturing on that subject at the time.

The practical working of the shoe is so well described by the editor of the *Medical Gazette*, in the number of December 28, 1867, that I will take the liberty of transcribing his report in that journal:

"An Improved Club-Foot Shoe.—Dr. Sayre exhibited and applied at his last lecture a pair of club-foot shoes to the little child of Dr. ——, of New Jersey, which, in their mechanical construction, ease of application, and efficiency of action, surpassed any thing of the kind we have ever seen, and which will doubtless soon replace all the cumbersome machinery hitherto in use in this unfortunate class of deformities.

"Dr. Sayre regards almost all the cases of club-

foot as being of a *paralytic* origin, and therefore the necessity arises of supplying some artificial, constantly contracting force, to take the place of the paralyzed muscles, as the only means, in addition to galvanism and friction, that is necessary to restore them to their normal position; and by the proper adjustment of this force almost all of these deformities can be rectified, without resorting to tenotomy. This is certainly a very great improvement in their treatment.

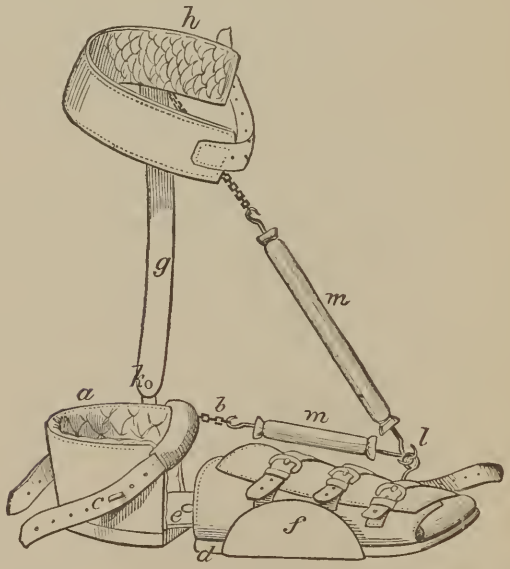
"The simple yet efficient plan suggested by Mr. Barwell, of applying elastic tubing, secured at the points desired by the means of adhesive plaster, has the very serious objection of irritating the skin, which, in young children, is very annoying, sometimes necessitating omission of its application for several days, and at the same time interfering with the manipulations and frictions which are so essential in their treatment.

"The simple but ingenious shoe contrived by Dr. Sayre is so constructed that it can be applied and secured accurately to the deformed foot before the elastic force is attached, *instead of adjusting the foot to the shoe*, while the power is acting, as is the case in all other instruments, and this is the essential difference between it and the ordinary shoe with a jointed sole now in use, after which it is modelled.

"The accompanying drawing (Fig. 19) and explanations give a very correct idea of its construction and mode of action.

"The shoes were applied in this instance with

Fig. 19.

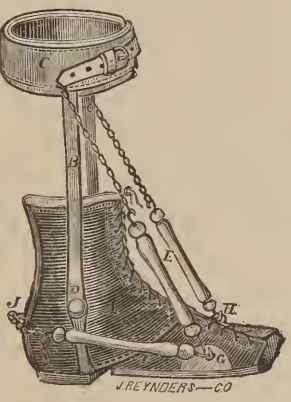


a. Cushioned iron cup to receive the heel. The heel cup should extend forward so far that the band, *b*, shall not press upon the ankle, except in front; otherwise, it would girdle the limb. *b*. Elastic tubing to go in front of the ankle-joint, to secure the heel in position, and fastening at *c*, an iron hook on outside of heel cup. *d*. Sole of shoe, with cushions and straps, to secure the foot in front of the medio-tarsal articulation. *e*. Joint connecting sole with heel. *f*. Elevated plate of iron properly cushioned to make pressure against base of first metatarsal bone. *g*. Steel spring connecting shoe with *h* strap, to go around the upper part of the leg. *k*. Joint opposite the ankle. *l*. Stationary hook, opposite little toe, for attaching the India-rubber muscles. *m*, *m*. India-rubber tubings, with chains attached, for the purpose of making flexion and eversion.

the most satisfactory results, the child in a short time after their adjustment running about the lecture-room, with her feet on the floor in a natural position, which had never been accomplished by any of the numerous instruments she had formerly worn."

In January, 1868, I improved this shoe by putting in the sole, opposite the medio-tarsal artic-

Fig. 20.



ulation, a *ball-and-socket*, or universal joint, instead of the hinge-joint, which permitted only lateral movements. In addition, the shoe has been made more comfortable and convenient by a slight

heel, and by making the anterior part of the sole like that of an ordinary shoe, and not so clumsy as that of most club-foot shoes. The upper leather laces neatly over the foot, adapting itself more perfectly than if arranged with straps and buckles. (*See* Fig. 20.) The shoe as applied is seen in Fig. 45, page 96.

The shoe pictured above is arranged for valgus or varus. There is really no essential difference between the different forms of talipes, and the single principle is to apply the artificial muscles in such position as shall best supply the place of those paralyzed.

My friend Prof. A. B. Crosby informs me that he has made a very cheap and serviceable substitute for my shoe, in the following manner: Having procured a pair of stout shoes which fitted the patient well, he cut the sole of the one for the deformed foot quite across, opposite the medio-tarsal junction. The two parts he connected by two links of chain, and made the necessary eversion or inversion by elastics. If to this an upright of tin or sheet iron were added, for the application of muscles for the elevating of the toe, I doubt not it would serve every purpose in most cases.

Such a device will be of great service to gentlemen who practise at a distance from cities, and

who, therefore, find great difficulty in obtaining instruments. Many other succedanea will doubtless suggest themselves, for "necessity is the mother of invention."

Certain things should be borne in mind (to which attention has already been called, but which will bear repetition) in making any dressing: The aim of the dressing or instrument is simply to imitate the action of the surgeon's hand; and that is best which nearest accomplishes this, or which most readily permits the hand actually to be used; accordingly, an apparatus combining elastic force is far superior to any fixed applhance; and, moreover, of the dressings constructed on this principle, that is to be preferred which is the most readily removable. Shoes, therefore, are better than bandages or splints. A proper shoe must have a joint opposite the main joints of the foot—the ankle and medio-tarsal junction; it must be arranged for the ready application and adjustment of elastic power, and it must not girdle the limb at any point so as to interfere with the circulation.

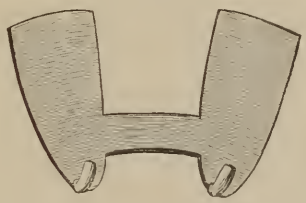
The plan of treatment devised and practised by Dr. Henry Neil, of Philadelphia, in 1825, and which was so well described by Dr. John L. Atlee, of Lancaster, Pa., when discussing my report at the meeting of the American Medical Association in

Washington, May, 1868, is so correct in theory—viz., compelling action in the partially paralyzed muscles in order to remove the deformity—that I give the substance of Dr. Atlee's remarks, in order to claim for American surgery the credit of having first proposed the correct or physiological plan of treatment. Dr. Neil, although a gentleman of high professional standing and of great practical ingenuity, was not much of an author, and I can find no account of his treatment, although it may have been published in some of the medical journals of that date. None of the medical gentlemen present at the meeting had ever heard of the plan before; and it is due to the memory of Dr. Neil that it should be permanently recorded to his credit. The plan of treatment is simply to fasten the child's feet to a board made to fit the soles of the feet, and joined together opposite the ankle-joints. The restraint is, of course, irksome to the child, and, in his efforts to kick himself out of the bandages, he brings into action all the muscles of the legs—accomplishing the very object desired—and, in the graphic language of Dr. Atlee, "kicks himself straight."

To make an apparatus of this kind to fit the child, you place his foot on a piece of folded paper, about one inch and a half or two inches from its

folded edge; mark with a pencil the size of the child's foot, commencing at his inner ankle, and going round the heel, the outside of the foot and toes, and back to within one-half inch of the starting-point. From these two points draw lines at right angles to the folded edge of the paper, and then with scissors cut the double paper, and when unfolded you have the pattern from which any carpenter can make, in a few minutes, the necessary board out of light but strong wood. (See Fig. 21.)

FIG. 21.



Dr. Henry Neil's Apparatus for Club-Foot.

A strip of leather is folded into a loop and nailed at either heel, through which a strip of adhesive plaster is passed, and carried in a "figure of 8" over the instep and around the foot-board. Such other bandages as are needed to secure the foot in position are of course applied in the proper manner.

I have tried this plan in several cases, and have been well pleased with the result, but do not find

it as satisfactory as the adhesive plaster and India-rubber spring, as it gives the child considerable uneasiness, and few mothers will submit to the continuance of a plan of treatment which causes such distress to "the baby."

After-treatment.—The simple application of an instrument, however perfect in its construction, is but a small part of the treatment of club-foot. Friction, shampooing, whipping of the paralyzed muscles, and the manipulation of the foot above described, should be repeated daily, and galvanism applied every day or two. The nurse should be instructed to watch for the occurrence of excoriations, as they, if allowed to take place, seriously retard the treatment. To prevent this, the application of astringents should be frequently repeated.

The treatment should be persevered in for a long time. In the most favorable cases a few months may suffice for a cure, but, as a rule, the treatment should not be relaxed when the deformity is apparently cured; it should be continued with the hope of developing the paralyzed muscles to the same or nearly the same degree as those of the sound limb. If this be accomplished, relapse can hardly take place.

It is true that in some cases the disease of the nervous system is so great that we may not restore

the muscles to their normal contraction as soon as we would wish; but even in these, the most unfavorable of cases, by the use of an instrument for retaining the foot in place, we shall at least have preserved the natural position of the feet, and thus have prevented the hideous deformity that would otherwise have resulted; and, by the application of artificial muscles, to take the place of the paralyzed ones, have enabled the patients to walk without limping. The exercise they are thus enabled to take, while the blood-vessels are held in their natural relation to other parts, is the very best method of developing the growth and nutrition of the limbs. Whereas, if they are permitted to walk without the feet being retained in their natural position, the weight of the body has a tendency to increase the deformity, and the abnormal position of the blood-vessels, both arteries and veins, interferes with the natural circulation of the parts, prevents development, and in fact tends to atrophy.

The faradaic and galvanic currents will also have a much more beneficial effect upon the limb when retained in its natural position, than they have when applied with equal power while it is distorted.

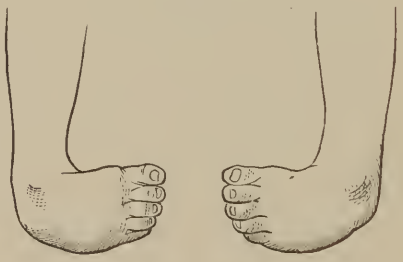
Case I.—*Double Talipes Varus, Congenital; treated by Sole-Leather and Adhesive Plaster; Re-*

covery perfect.—On the 25th of March, 1863, I was requested by Dr. C——, of New Jersey, to see his little child, five days old, who had been born with talipes varus or varo-equinus of both feet.

I saw the child on the same day, and found him very vigorous and robust, and exceedingly well developed, with the exception of his feet, which exhibited a very severe form of varus, with slight equinus, and which are well represented in Fig. 22.

The feet were much colder than any other part of his body, and quite blue or purplish in color.

FIG. 22.



By grasping the foot in one hand, and the leg in the other, I could with some considerable effort, continued for a few minutes, evert the foot, and slightly flex it. The capillary circulation seemed to be arrested entirely when I did this, and the foot became as white as snow. After holding it in this position a few minutes, I would relax my hold,

when the foot would immediately resume its abnormal position, and in a short time circulation would return to it as at first.

I then performed the same operation on the other foot. After repeating these manœuvres a number of times on each foot, allowing some minutes to elapse between each effort at straightening them, I found that I could bring them into almost a natural position, and retain them there by a very slight force.

I then wrapped the feet and legs in cotton, and applied a piece of sole-leather previously softened in cold water, and cut in the shape of a half-boot.

After the roller had been carefully adjusted, and the leather accurately modelled on his foot, the foot was forcibly held as nearly as possible in its natural position, while the roller secured the rest of the leather to his leg.

It was then held in this position with the two hands for a short time, until the leather had received its form, and, when perfectly dry, it held the limbs very securely in place.

These bandages were removed on the third day, and the feet and legs well rubbed and moved in all directions. The leather was then again softened by soaking in cold water, and reapplied as at first, with the only difference that at this time the feet

were forced completely around into a natural position, and held there, until the leather became dry and retained them there. The bandages and leather were removed every day, and the feet and legs freely rubbed and moved in all the joints by the nurse, after which the bandages and leather were reapplied.

This plan was pursued for five weeks, when it was found that the feet could be retained in their natural position by a very slight force. Strips of adhesive plaster were then applied, commencing on the dorsum of each foot, passing around the inner margin, and then, the foot being held well outward and flexed as much as possible, passing upon the outer side of the leg, where they were secured by a roller.

This answered the purpose of holding the feet in a natural position, and at the same time admitted of slight motion at the ankle-joints.

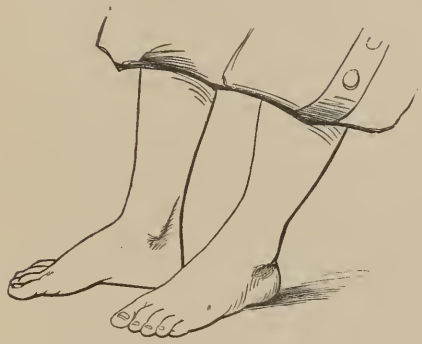
This plan was continued for some weeks, until the feet remained in their normal position without artificial aid, when it was discontinued.

The child began to walk when sixteen months of age, with the feet perfect in form and development.

The photograph, Fig. 23, taken April, 1868, five years after all treatment was suspended, shows how

well the feet are developed, and the perfectness of the recovery.[1]

Fig. 23.



Case II.—*Congenital Talipes Equino-Varus; Tenotomy performed three times without Relief of the Deformity. Permanently relieved by India-Rubber Muscles and Electricity.*—Walter Cline, æt. three, New York City, was brought to me, May 17, 1863, for well-marked talipes varus, which was congenital. The mother stated that "at birth the left foot was much smaller than the right, and was almost without any heel; the whole leg was a little smaller than the right; and that, until he was five years of age, the sensation of the limb was very imperfect, but never entirely absent." The note of treatment at that time in my record-book is: "I divided contracted muscles (tendo achillis and tibialis anticus), and brought the foot

[1] 1882—this young lady's feet remain perfect.

into position by adhesive straps. Progress rapid and result satisfactory."

I had divided the muscles, having full faith in the necessity of this treatment. The deformity was reduced readily, but, as will be seen, the true disease was not affected, and consequently the deformity returned.

May 22, 1867.—The boy returned, being seven years old. Tenotomy had been performed three times in all, but with no satisfactory result, although he had worn a variety of club-foot shoes. The foot was much smaller than the other, as was also the leg. When standing, the foot became almost completely inverted, and the heel drawn up, the weight coming upon the dorsum of the foot, just behind the little toe, and the one adjoining, near the metatarso-phalangeal articulation, at which place was a large callosity, which was very tender. The astragalus was subluxated forward, and could be distinctly felt in front of the tibia, making a serious deformity.

The foot could be quite readily brought into an almost natural position, with only a moderate amount of force, showing conclusively that the deformity was one of paralysis, and not dependent upon any abnormal contraction.

I applied the India-rubber tubing on the outer side of the leg—according to the plan of Mr. Bar-

well—and the foot was almost immediately brought into its natural position. By a very slight addition to the thickness of the heel and sole of his shoe, to equalize the length of the limbs, he walked almost naturally in a very few days.

He was directed to run around as much as possible, and to have electricity applied over the peroneal muscles three to five minutes daily.

July 1.—The mother states that after three or four weeks the leg and foot had so much increased in size that she had to get a larger shoe. Re-adjusted the bandages, and applied new plaster. Continue treatment as before.

September 1.—Has improved so much that, when all the bandages and India-rubber are removed, he can slightly evert and flex the foot by making a strong effort to do so. I ordered a well-fitting shoe, with a steel spring on the outer side to run up the leg, with a hinge at the ankle-joint, and a rubber spring sewed fast opposite the little toe, and secured to a chain at the top of the steel spring, near the head of the fibula.

January 1, 1868.—He has improved so much that he can tread flat upon his foot without any assistance. I therefore took off the steel support and rubber spring.

His foot and leg are well nourished, and very

much increased in size. The sole and heel require about one-fourth of an inch more than the other shoe, to equalize the length—otherwise there is no deformity.

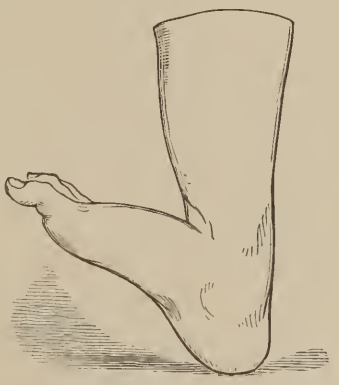
October 31, 1868.—Boy has not been seen since last entry till now. He has been away from the city. Has given up the use of the elastic shoe, and has been wearing an apparatus consisting simply of a firm iron sole, with no joint, and which is too narrow for the foot, and a stiff upright bar, jointed at the ankle, which is fastened about the calf. This change in treatment has hindered the progress of the cure. The skin is warm and of a good color, but the muscles are weak. In walking, he is unable to evert the little toe, allowing the weight of the body to fall upon the outer edge of the foot, thus endangering a relapse. The cure is, however, so well advanced, that I think an ordinary, neatly-fitting, broad-soled shoe, with an upright bar, and a rubber for everting the foot, similar to that shown in Fig. 40, will be sufficient for its completion.*

Case III.—*Talipes Calcaneo-Valgus Paralytica: Cure by Elastic Extension.—May* 4, 1867.—

* Since the above was in type Walter Cline has again called at my office. The cure is now perfect, the sole of the foot coming flat upon the floor without any artificial aid. The leg has grown to very nearly the same size as the sound one.

G. B. M., æt. three, New York City. During dentition suddenly lost the use of his lower limbs. He was unable to stand. His dorsal muscles were so weak that he had to be propped up in a sitting posture. After the expiration of three weeks he began to creep, dragging his body. A weight was then attached to each foot. After two months he was able to stand, when it was noticed that his right foot had less power than the left. The toes were elevated and turned outward, and the heel depressed. In March, 1866, an upright support was made for his leg, and elastic extension applied in

FIG. 24.



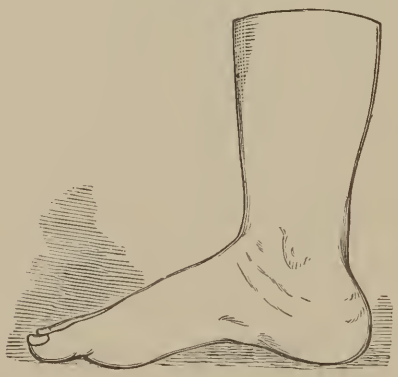
G. B. M., May 1, 1867.—From a plaster cast.

the popliteal space, to take the place of the gastrocnemius. He has worn this above a year. He

is able to walk well with a boot on; but when it is removed there is no improvement upon the condition existing before treatment. There is no tendo achillis visible; the anterior muscles are very prominent; the heel is atrophied, and the internal malleolus displaced. See Fig. 24. Artificial muscles were applied, after the manner of Mr. Barwell, over the gastrocnemius and tibialis anticus muscles.

Fig. 25 shows the condition after the use of the rubber muscles, galvanism, and strychnia hypodermically, from May to September.

Fig. 25.



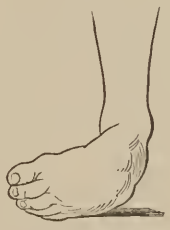
G. B. M., Sept. 19, 1867.—From a plaster cast.

Case IV.—*Talipes Varo-equinus Paralytica relieved by Elastic Tension.* — Catharine Nash, aged four years, No. 16 Washington Street. The

mother states that the child, when two years of age, went to bed in perfect health. In the morning both lower extremities were perfectly paralyzed. The probable cause was an apoplectic effusion into the lower portion of the spinal cord.

After a few weeks, she began to move the right limb a little when it was tickled or pinched; these movements gradually increased, until she had recovered perfect motion of that side. The left leg remained paralyzed on the outer side, causing a severe form of varo-equinus, as seen in Fig. 26. When her weight was put upon it the varus was very much increased, the foot making almost a complete rotation at the medio-tarsal articulation.

Fig. 26.



The limb was very much wasted, blue and cold. The peronei muscles would not contract under a strong Kidder's battery.

On the 16th of August, 1867, I applied the India-rubber springs over the tibialis anticus and

peronei muscles, in order to elevate and evert the foot. The spring was applied with only a moderate degree of tension, but in less than half an hour it had produced a marked change in the form and position of the foot. The chain was shortened a few links, and in three hours she could stand upon her foot, touching the ground both with the heel and great toe, as in Fig. 27.

FIG. 27.

FIG. 28.

Electricity was applied in this case to the outer and anterior portions of the leg from ten to fifteen minutes every other day, and the child encouraged to run around as much as possible. The plasters and tin had to be readjusted occasionally; but at the end of eight months she had so far recovered as to require only the slightest elastic, hooked into the

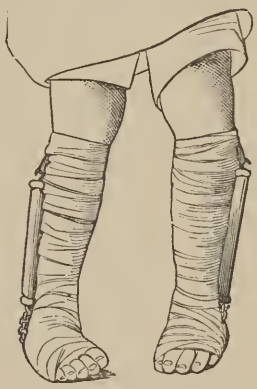
eyelet of an ordinary shoe, and attached above to her garter. With this slight force she could elevate the toes and walk perfectly naturally, as seen in Fig. 28.

Case V.—This case shows very well the effect of only a few hours' tension on the distorted feet, particularly the left one.

Fig. 29.

J. P., aged 3 years—congenital double talipes equino-varus, October 31, 1867.

Fig. 30.



J. P., October 31, 1867—three hours after the application of rubber muscles.

Fig. 29, from photograph, shows his condition at time of application of dressing. Fig. 30, also from photograph, shows the result after only three hours' application.

The India-rubber springs were worn with the tin splint and adhesive plaster, as seen in Fig. 30, for two months.

After this time he wore the improved shoe with ball-and-socket joint, which answered much better, as the spring from the back of the heel to the little toe materially aided in everting the feet, and when this was properly adjusted he could walk remarkably well.

This boy went to the country, and I lost sight of him; and I am therefore unable to tell the ultimate result of the treatment in his case.[1]

Case VI.—*Congenital Varus of Right Foot, and Varo-calcaneus of Left Foot, cured by Elastic Tubing.*—John F. Calhoun, 432 Second Avenue, aged six months (Fig. 31), was brought to the out-

Fig. 31.

door department of Bellevue Hospital, November 7, 1867, under care of Dr. W. H. Young. Parents healthy; no other children. Treatment by elastic tubing (*see* page 48). The right foot was dressed November 11th, the foot being quite easily brought round and retained in the straight position. No-

[1] Recovered perfectly in less than two years.

vember 15th, dressings have given no pain or uneasiness to the child. Reapplied by Dr. Sayre.

20th.—Deformity of right foot about one-half; dressings applied to left foot to-day, which is retained in position by a very small amount of elastic force.

The dressings were reapplied about once a week, until January 2d, when they were removed, the feet being nearly in the normal position, and easily retained in a straight position by a common pair of laced boots. The India-rubber will be reapplied as soon as the child commences to walk, if necessary.

The photograph, Fig. 32, showing the improvement, was taken April 8, 1868.[1]

Fig. 32.

Case VII. — *Double Talipes Equino-Varus treated by Section of Plantar Fasciæ and Elastic Extension: Section of Integument ultimately required.—July* 22, 1867.—Annie L. W., æt. three and a half years, New Jersey. The deformity is

[1] Is now perfect, 1882.

congenital, and is attributed by the father, a physician, to "a fright of the mother at a deformed cripple while the babe was in utero." When three months old the child was brought to me. I then succeeded in bringing the feet nearly into their proper position by handling, and then applied a leather splint, as described on page 35. The father continued the treatment for three months, with benefit. He then entered the army, and the treatment was changed for another plan. During the last eight months she has been treated by a fixed modification of Scarpa's shoe, which caused ulcers upon the dorsum of both feet, and the condition has become worse rather than better for the treatment. The feet are now strongly inverted, and the plantar fasciæ firmly contracted. She walks by separating her feet as far as possible, and taking short, awkward, waddling steps. On the sides of the feet are scars of former tenotomy. On each dorsum is a cicatrix of a large ulcer, caused by treatment, which, I fear, seriously complicates the treatment of the case.

July 22, 1867.—Cut both plantar fasciæ. The feet were then bound down to thin board-splints.

August 6th.—Applied two rubber muscles to right foot, one to the left. In less than an hour she began to run about the office.

August 20th.—Has much improved. Only suffering complained of is the pressure of the plaster on the callus produced by the shoes formerly worn. Readjusted plasters, so as to relieve this difficulty.

In December the shoe described on page 58 was constructed for her, and afterward she wore the ball-and-socket shoe, as seen in page 59.

December 17, 1868.—The father again brought the child to my office. He complains that for some reason the eversion of the feet is still painful: the child has defeated the treatment by turning her feet in such a manner as shall bring the outer edges upon the ground, by that means relaxing the strain upon the plantar fasciæ; when this manœuvre fails, she forcibly inverts the feet with her hands. Examination showed the fasciæ to be tense and contracted, reunion having taken place. Accordingly, the child being under chloroform, I cut the plantar fasciæ, but the deformity did not yield, the integuments having become contracted and rigid. I accordingly made an incision about an inch long, and brought the foot into position. The straightening of the foot caused the edges of the wound to separate about three-fourths of an inch.

Since this last operation the father reports the progress as perfectly satisfactory.

Case VIII.—S. S., Brooklyn, aged seven, was born with double club-foot, according to the mother's statement; was operated on when three months old by a surgeon in this city, who cut the tendo achillis of both sides; a few months afterward the tendons of both anterior tibials were cut, and about two years since the tendo achillis was cut again. Shoes of different kinds had been worn all the time, and at last the surgeon had abandoned the case to Mr. Ford, the instrument-maker, who brought the child to me.

The feet at the time were secured in shoes with a firm steel sole, and, although they had, opposite the ankles, joints in the rods running up the legs, which were acted upon by screws, and intended to elevate the feet, still, as they were only moved when the assistant applied force to the screw, and then fixed in the position obtained, the muscles of the leg, even the normal ones, from being so long in a passive condition, had become atrophied; and his legs, from the ankle to the knee, were more like two straight sticks, of nearly equal size at top and bottom, than like an ordinary leg with well-developed muscles.

When the shoes were well adjusted, he could walk by the aid of canes, on the outer corner of the little toes, for a little distance, the feet cropping

over each other; but the pain was so great that in a few minutes he would give up his exercise, and could not again be induced to walk until the shoes had been removed, and the feet allowed to rest.

When he attempted to walk without the shoes his feet dropped and were inverted, so that he walked upon the outer part of the foot, where there was an extensive callus. (See Fig. 33.)

On the 27th May, 1868, Dr. L. M. Yale put the child under chloroform, when I found that by moderate force I could bring the left foot into nearly a natural position.

On the right side, the heel could be brought down to a natural position, but it was impossible to elevate the foot, or rotate it outward; in fact, the whole anterior part of the foot seemed like a solid plaster cast, with no motion at any of the joints, except the toes.

I therefore made a free subcutaneous section of all the resisting structures in the hollow of the foot, closed the wounds with adhesive plaster and a roller, and immediately brought the foot almost straight. It was secured in this position by a board under the foot, and a roller, as indicated on page 39.

I directed Mr. Ford to make a pair of shoes, with orbicular joints in the soles, and elastic rubber to elevate the foot and rotate it outward, as I have

already described, and to return with the child when the shoes were completed.

Fig. 33.

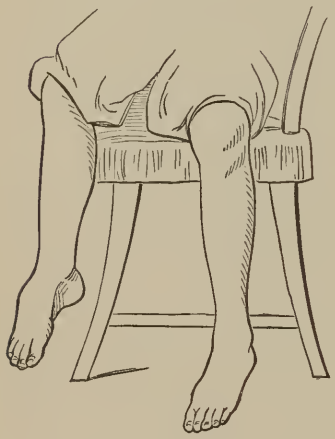
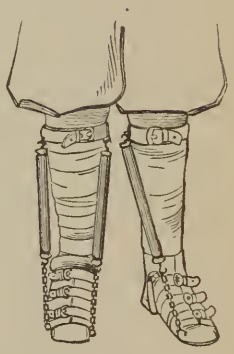


Fig. 34.



He returned on the 10th of June, thirteen days after the operation. The wounds had partly healed without any suppuration, and the child had suffered very little pain from the operation. The bandage had been removed once or twice by my assistant, and the foot well washed and rubbed.

Mr. Ford had constructed the shoes remarkably well, from the model I had given him. They were put upon the child, and fulfilled all the indications desired most admirably. The rubber was hooked on with only a very moderate force at first, but was

gradually increased a link at a time for an hour or more. At the end of about three hours his feet were in a perfectly natural position, and he could walk without a cane, with his heels upon the ground, and his feet parallel with each other. He walked to the photograph gallery without assistance, and had his picture taken (see Fig. 34), thirteen days from the operation.

Electricity was applied to the anterior portion of the leg and foot every other day, and very free handling and motion made to all the joints of both feet.

June 20, 1868.—He can flex his feet slightly without the aid of the rubber; his feet are much warmer, more natural in color, and the legs have increased around the calf nearly three-quarters of an inch in circumference.

January 1, 1869.—The improvement has continued up to the present time. The mother has applied faradism, frictions, and has manipulated the feet daily with great care, and the result has been a perfect cure.[1]

Case IX.—H. F., Hudson, N. Y. A girl four years of age was sent to me to divide the tendo achillis for club-foot of the right side. The history of the case as given by the mother was, that the child presented as a "cross-birth," and was deliv-

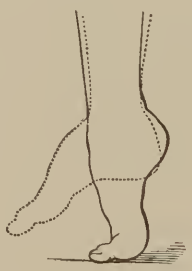
[1] 1882—cure remains complete.

ered by the doctor by turning, and the deformed foot was the one seized by the doctor in the delivery; and, in the opinion of the physician who delivered her, the foot was injured at the birth.

When the child was old enough to walk, this foot was found to drop in front, the ankle was stiff, "and the heel seemed to be pinned to the back of the leg." "Dr. Taylor's Swedish movement-cure" was tried for two years, but with no result beyond making the ankle more flexible.

When the foot is permitted to hang in its natural position, there is a remarkable protuberance of the astragalus, as seen in Fig. 35, which was traced from her leg. By taking hold of the foot,

FIG. 35.



however, with a very slight force the tendo achillis could be stretched, and the heel easily brought down to its natural position, at a right angle with the leg, as seen in the dotted lines. But the foot, in

front of the medio-tarsal articulation, still drooped, as seen in Fig. 35, and could not be elevated.

In my note-book I find the following entry, made at the time of my first examination, by my assistant, Dr. Yale: "It is quite possible that the plantar fascia and short flexors of the foot will require division, but shall at first attempt to accomplish the restoration of the foot by manipulation, and shoe with elastic extension." The result of the treatment proved the wisdom of this decision.

I put her under chloroform, and by very firm pressure and extension, continued for some time, I found that I could make a very decided diminution of the arch in the hollow of the foot, and very materially increase its length; and, as I never cut tissues that will stretch under a moderate degree of force, I resolved to use the shoe, without resorting to tenotomy.

The foot was handled with great freedom every day while the shoe was being made, and stretched as much as the child could bear without suffering much pain; and electricity was applied to the anterior muscles of the leg every other day.

On the 24th of June, the photograph of Fig. 36 was taken, and then an ordinary shoe with steel supports on either side, jointed opposite the ankle, and buckled around the leg above the calf, to give

attachment to an elastic rubber which ran from a stirrup over the ball of the toes, for the purpose of elevating the foot, was applied, and the photograph of Fig. 37 was taken about one hour afterward.

Fig. 36. Fig. 37.

Talipes Plantaris Paralytica.

With this shoe on, and the rubber properly adjusted, she runs with perfect freedom, and without the slightest limp.

October 31, 1868.—A slight inversion of the toe remains. Ordered a ball-and-socket shoe in order that the eversion muscle may be applied. This corrects the inversion perfectly.

Case X.—*Talipes Plantaris, Section of Plantar Fascia, Flexors, and subsequently the Integuments. Elastic Extension. Cure.*—Miss N., aged twelve, of Georgia, gives the following history. When sixteen

months old she had an attack of convulsions, and another four months later. Soon after, the left foot was noticed to be contracted; or, as the mother expresses it, "she was pigeon-toed when her weight came upon the foot." For a short time she wore some sort of a club-foot shoe, but soon abandoned it. No treatment beyond liniments was employed, until October, 1865, when, in accordance with the advice of several surgeons, the tendo achillis was cut, and the treatment continued by applying a very stiff club-foot shoe. No material benefit followed the operation. The deformity increased, till, in the winter of 1867–'68, it was so far advanced that, in walking, the toe alone touched the ground. In May, 1868, the tendon of the extensor proprius pollicis was cut, with the hope of relieving the deformity. This hope was not realized, the difficulty in walking being greater than ever. The parents accordingly brought the child to this city, to Prof. W. H. Van Buren, who sent the case to me.

July 29, 1868.—The position of the foot, when no weight is upon it, is as in Fig. 38; when, however, the child attempts to walk, the position becomes as in Fig. 39. The great toe is semi-luxated by the pressure falling directly upon the ball of it.

Under chloroform I cut the plantar fascia and short flexors of the foot, and fastened the foot to

a board. The patient went out of town for a few days, and the foot was not properly attended to. The wound did not unite by first intention, but a slight amount of suppuration followed.

Fig. 38.

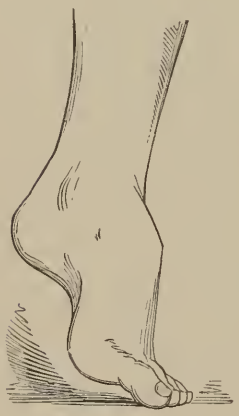
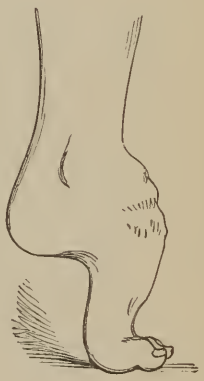


Fig. 39.



August 17*th*.—The foot still resisted attempts at straightening. I accordingly divided the integuments in the sole of the foot, forcibly pressed the tarsal bones into proper position with the hand, and broke up the adhesions in the sole of the foot. The foot was then firmly bandaged to a board with a large compress of wool over the instep. The operation was followed by some febrile reaction which had disappeared on the following day.

September 1, 1868.—The progress has been uninterrupted since the last operation; though the wound in the sole is not entirely healed, she is able to have the shoe with the jointed sole applied, and to walk in it without pain, the heel being down and the foot in a natural position. Since the operation the foot is about one and a half inches longer than before.

September 17*th*.—Recovery perfect. She everts and flexes the foot voluntarily. In walking, she wears an ordinary laced boot, with a single rubber muscle from opposite the little toe to one of the upper eyelet-holes. See Fig. 40 (from a photograph).

Fig. 40.

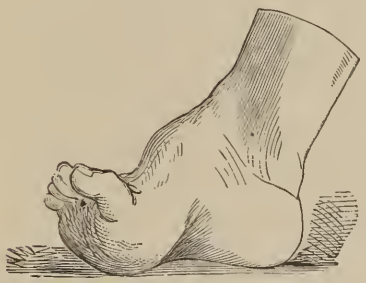
Case XI.—*Talipes Plantaris, or Cavus, Traumatica, with Dislocation of Tarsal Bones,*

Eighteen Years' Standing. Operation, Treatment by Elastic Extension. Cure. September 1, 1868.—Miss F., aged twenty-five, New York City. When about seven years old she injured her right foot by jumping from the seat of a high wagon to the ground. The injury was sufficient to cause severe pain for a time. After the disappearance of the pain the foot was neglected for two or three years, but, after the lapse of this time, surgical care was demanded. The physician in attendance cut the tendo achillis. He proposed section of the plantar fascia, but, for some reason, it was not done. From that time she was able to walk tolerably well until between three and four years ago, when, she having adopted a sedentary occupation, the foot became painful in walking, and the ankle, which had always been weak, frequently turned under her weight. She attributes this change to a failure of strength from confinement in-doors, rather than from a progressive contraction of the foot.

The sound foot is eight inches in length, the diseased one is so shortened (see Fig. 41) by the contraction of the sole and elevation of the toes, that but five inches rest upon the ground. The calf of the sound side is twelve and a quarter inches in circumference, that on the injured side ten and a half inches. The limbs are of the same length.

After anæsthetizing the patient, the deformity was reduced by cutting the plantar fascia and then

Fig. 41.



From a plaster cast. The contraction of the tendo achillis is only apparent, the foot being extended when the cast was taken.

forcing the projecting bone as a wedge down between the adjoining bones. To accomplish this, very considerable force was required. The wound of the skin in the sole was tightly closed, as described above when speaking of tenotomy. The foot was secured in proper position by bandaging it strongly to a board padded with cotton. The foot was now seven inches on the ground, instead of five. Dr. J. C. Nott assisted me in this operation.

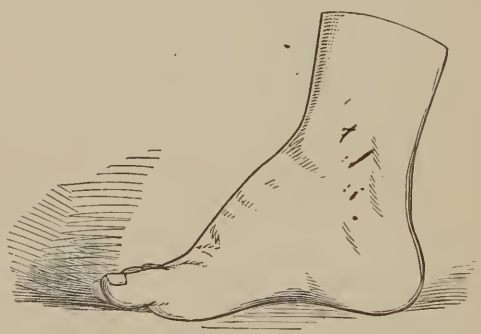
September 12th.—Applied ball-and-socket shoe, lacing in front, and with a slight heel.

September 20th.—The patient having returned to her work, the foot has troubled her considerably, owing to tenderness over the tarsus. The force

required to reduce the bones to proper position appears to have caused a slight periostitis, which is reëxcited by any attempt at walking. Rest for a week, with cold and sedative lotions, were accordingly directed. The result was perfectly satisfactory. Ordered to manipulate the foot with the hand.

January 1, 1869.—The foot has so much improved that the club-foot shoe is no longer necessary, an ordinary, neat-fitting, laced boot sufficing to keep the foot in its normal position. Fig. 42 shows the condition of the foot.

Fig. 42.



From a cast taken December 21, 1868.

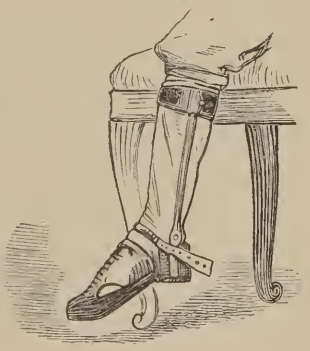
Case XII.—*Talipes Varus Paralytica, acquired, of five Years' Standing. Unsuccessful Treatment by Tenotomy. Subsequent Treatment by Elastic*

Extension successful.—September 9, 1868.—Harry M., aged seven, New York City. Until two years of age was perfectly well. At that time he suffered from a severe diarrhœa, and, during the course of the disease, was suddenly seized with paralysis of both upper and lower extremities. After about two months he recovered the use of his arms and of his left leg. The peroneal muscles of the right leg remained paralyzed, and are still so, a marked talipes varus being the result.

In 1865 the family physician cut the tendo achillis, the tendon of the tibialis anticus, and the plantar fascia, and applied a fixed club-foot shoe, which allowed no motion to the foot. The result

FIG. 43.

FIG. 44.



was negative. The condition of the foot at the present time is shown in Fig. 43.

I applied the ball-and-socket club-foot shoe, with rubber muscles, for flexion on the fibular side of the leg, and for eversion of the foot. Figs. 43, 44, and 45 are from photograms taken at the same visit to the photographer's. Fig. 43 exhibits the deformity. Fig. 44 shows the shoe adapted to the foot (not the foot to the shoe), and Fig. 45 the restoration of the foot to its normal condition, after the rubber muscles were attached.

In addition to wearing the shoe, frictions and electricity have been applied to the leg.

January 9, 1869.—The progress toward cure has been steady. The calf of the paralyzed leg has

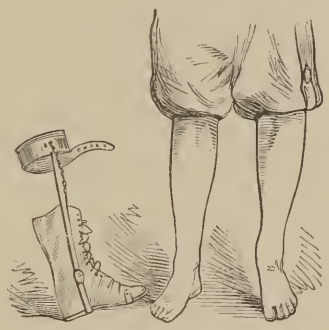
FIG. 45.

increased about an inch in circumference since the commencement of treatment. The power over the

muscles has increased, so that he can voluntarily flex the foot, although he is still unable to evert it.

January 22*d.*—The condition of the case is shown in Fig. 46, from photograph by O'Neil.

Fig. 46.



Case XIII.—*Congenital Double Talipes Varo-Equinus. Tenotomy. Reduction of Dislocated Tarsal Bones by Force.*—Herbert F. C., aged ten, Massachusetts. The mother thinks the deformity due to the fact that, about the second month of pregnancy, she sat in a cramped position for some hours, and, from that time till the birth of the child, was impressed with the idea that the child would have deformed feet. When eighteen months old he was placed under treatment. Since that time he has worn constantly orthopedic shoes of one sort or another. They have, however, always been stiff

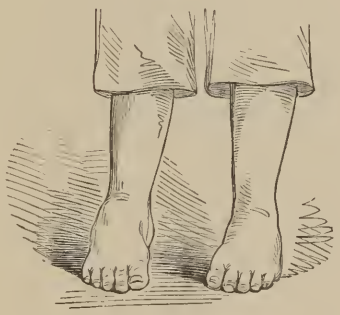
and fixed. At present the deformity is so great that he can with difficulty stand alone without the artificial support. Calves, nine inches and seven and a quarter inches. His gait is very labored and clumsy. The plantar fasciæ and the short flexors of the feet are tender when put on the stretch, as also are the tendons of the solei muscles. The head of the astragalus and anterior extremity of the calcaneum are protruded to a remarkable extent (*see* Fig. 47), from photograph by Mason.

Fig. 47.

November 16, 1868.—Before the class at Bellevue Hospital, anæsthetized the patient, cut the tendones achillis, plantar fasciæ, and the short flexors. By exerting great force upon the tarsal bones with the hands, they were forced down into their

proper places. The soles of the feet were fixed to boards and the feet properly padded and very firmly bandaged.

Fig. 48.

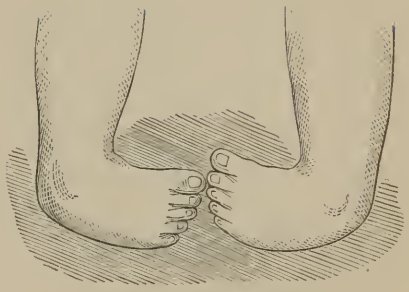


December 9, 1868.—There has been no disagreeable result from the force employed. The boy walks very well in the ball-and-socket shoe. The feet are very nearly in normal position.

Fig. 48 shows the change which had taken place, January 20, 1869, from photograph by Mason.

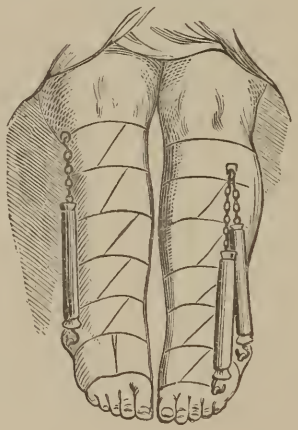
Case XIV.—*Double Talipes Varus, Congenital. Treated by Neil's Plan, later by Adhesive Plaster, and by Barwell's Method.*—November 5, 1868. A. J. K., aged three weeks, New York City. Has double, congenital talipes varus. The position of the feet is as in Fig. 49. Applied the dressing of Dr. Henry Neil (Fig. 21).

Fig. 49.



November 10*th*.—The treatment has straightened the feet considerably, but the child has cried

Fig. 50.



so much that the mother removed the dressing. Accordingly, November 14th, the adhesive-plaster

dressing (page 46) was applied. This was worn for two or three weeks, when it became loosened. The mother neglected to come to the office again, and the child went without treatment for several weeks.

January 9, 1869.—Applied Barwell's dressing.

January 19*th*.—Result very satisfactory. Position as in Fig. 50. The inner edges of the two feet can be placed in apposition from heel to toe.

The following case of acquired talipes, the result of spinal meningitis, is of some interest, as illustrating the existence in the same patient of the most intense hyperæsthesia of the cutaneous surface and perfect or complete motor paralysis at the same time:

Case XVI.—Miss Hattie B., aged twenty-two. Was always robust and very active until December, 1868, when, in Stuttgart, Germany, she contracted typhoid fever during an epidemic. Can get but little account of this illness, save that it lasted many weeks, during much of which time the patient was in a state of low delirium, and later she was too weak to take much notice of occurring events. When she first recollected herself after the fever, all power over her limbs was gone. She could not even move a single toe on either foot, and could not lift a fork or spoon from the table. She had extensive bed-sores on the heels, over the sacrum and trochanters.

At this time the cutaneous surface of the whole body was so exceedingly sensitive as to cause her great agony when touched or rubbed, even in the lightest manner.

In August, 1869, her mother went to her, and found her suffering chiefly from the trouble which still in part remains, viz., contractions of the lower limbs with hyperæsthesia. Her knees at that time were very rigidly extended; the lower limbs, especially the feet, were excessively sensitive, the weight of a sheet being too much for her to bear.

The feet after washing could not be dried with a towel, raw cotton being used instead, and even this would cause an involuntary shudder as it touched the skin. Under the treatment at Stuttgart, the knees partly regained their mobility, the hyperæsthesia diminished, and the position of the feet was somewhat improved.

After her return to this country, Dr. Barber, of Leroy, New York, practised manipulations of the feet with the hope of diminishing the distortion, which is that of talipes equino varus, with a strong curve on the edge of the plantar fascia.

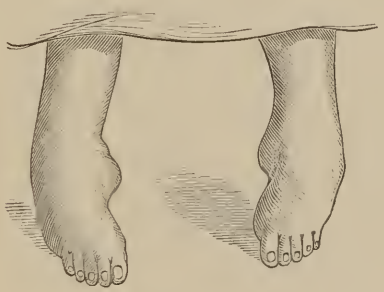
Dr. Barber improved the position of her feet somewhat, but, not being satisfied with the progress of the case, sent her to me in July, 1870.

The manipulations were continued for some

weeks, but the sensibility was too great to allow of the exertion of much force; in fact, you could scarcely touch the feet, or rub the skin in the lightest manner possible, without causing her to scream with agony. The deformity could not be rectified, even under full anæsthesia.

September 30, 1870.—The position of her feet are as seen in Fig. 51, from drawings by Dr. L. M. Yale, made at the time.

Fig. 51.



She was placed fully under chloroform, and I divided the tendo Achillis and plantar fascia of the left foot, and was then compelled to divide the skin also before I could restore it to position. The foot was then dressed with adhesive plaster and a board, as described on page 38. When the effects of the chloroform had passed off, she complained of great agony, although a full dose of

Magendie's solution had been given at four P. M. At six P. M. repeated the morphine.[1] This being the first and only case where continued pain has followed the operation, I have reported the daily notes of the case as taken at the time by Dr. Yale:

October 1*st*.—Continues to complain greatly; has not slept; gave bromide of potassium, without effect.

2*d*.—Some relief, due probably to the foot having slipped in the dressing. Fifteen-grain doses of hydrate of chloral seemed to produce better effect than morphine, to which latter she had become accustomed during her last illness. After her return to this country, she had great difficulty in breaking up the habit.

4*th*.—Dressed foot. At base of little toe an ecchymosed spot, looking likely to slough. Lessened the strain of the adhesive plaster.

6*th*.—Dressing very inconvenient; a simple side-strap substituted. Begins to have some appetite, but has constant chilly sensations.

10*th*.—Has been sitting up for past few days. Could bear pressure on foot much better. Allowed wound in sole to close. The tendo-Achillis wound has also united.

11*th*.—Had last evening, at ten P. M., a severe

[1] See Appendix.

chill, lasting an hour and a half, followed by fever and delirium; attempted to get out of bed. Delirium continued through the day; pulse 120; respiration 43. No signs of pneumonia, or any internal inflammation. Gave spiritus Mindereri and spirits of nitre; liquor potassæ arsenitis. Foot looks all right; no sign of trouble except the bruised spot under little toe from pressure of the board.

12*th*, 9 A. M.—Pulse 120; respiration 29. Erysipelatous blush running up left leg, and the back and inside of left thigh. Opened wound; found no confined pus; lips had granulated under the scab. Poultice to foot.

P. M.—Met Dr. Clymer in consultation. Pulse 118; respiration 29. Temperature under right thigh, $103\frac{4}{100}°$; under left (erysipelatous), 104°. To take hourly one grain of sulphate of quinine; one-half drop Fowler's solution; argentium nitricum topically. Food, every two hours, milk and broth.

The fever continued until October 28th. The highest temperature (under sound thigh) was 103°.8. Remissions below 100° occurred 12th P. M., 16th A. M., 19th A. M., 23d A. M., 24th P. M., 28th P. M. On the 17th the erysipelas became migratory in character, and diminished in severity. The ecchy-

mosed spot on the little toe was opened on the 15th, and discharged a little pus, from which time she began to recover. On the 23d, there was an eruption of sudamina; on the 24th, over back and nates, an eruption, very much resembling scarlatina, absent from the anterior surface of the body. This lasted until the 29th. From this time she convalesced slowly, and, after some time, the manipulations of the foot were again resumed, and resulted, in about six months, in producing a very useful and nearly normal foot, as seen in Fig. 52.

Fig. 52.

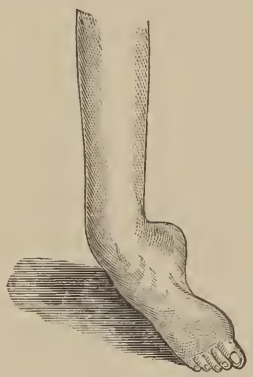
Hattie B., May, 1873.—Operated upon September 30, 1870.

The operation had been attended with so much danger, that I refused to operate upon the other foot until her general health could be improved. She, therefore, left the city for Leroy, New York, where she remained for two years, getting around

on her crutches, and bearing her entire weight on the "Sayre" foot (as she called it) without any pain; but the other foot was entirely useless, and very painful on the slightest pressure.

She returned in May, 1873, much improved in general health, with her left foot as seen in Fig. 52, and the right one as seen in Fig. 53.

Fig. 53.



May 18, 1873, Hattie B.—Anterior View.

May 19, 1873, she was put under chloroform by Dr. Yale, and I divided the tendo Achillis, and cut the plantar fascia, and dressed the foot with the board and adhesive plaster, as described on page 39, with an additional plaster around the foot, and drawn firmly upon the outside of the leg. An injection of morphine was administered hypo-

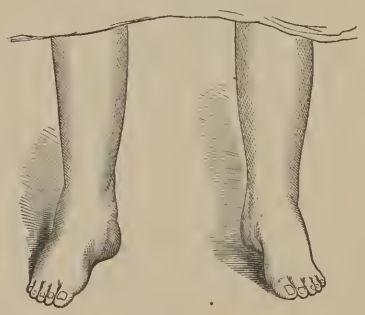
dermically. In the evening the patient was very comfortable, and declined taking any more morphine, on account of the difficulty she had formerly experienced in breaking up the habit.

June 18*th.*—Dressing was removed; had been on twelve days; all the wounds entirely healed, without pus. The instep was a little bruised, but no slough. The foot very much improved in position; heel comes down to the floor without pain. She is able to flex the foot voluntarily. There is some inversion of the foot, which is retained in position by adhesive straps.

24*th.*—Much improved; she is able to walk a little by the aid of a chair.

From this time she improved rapidly; was able

Fig. 54.



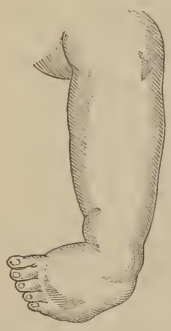
to have her feet shampooed and rubbed freely without pain, and on July 1, 1873, was able to

walk in an ordinary shoe. The feet are both shorter than natural, and thicker at the ball, on account of the contraction of the toes; but she is able to walk without assistance, with both feet naturally upon the floor, as seen in Fig. 54.[1]

The following case shows what can be done to rectify the deformities of the part by very simple means, if applied at an early age:

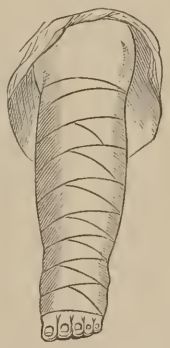
Case XVII.—A son of J. H. B., aged seven months, 16 East Third Street, was sent to me by Dr. J. P. Lynch, February 1, 1870, with congenital talipes varus of the left foot. (*See* Fig. 55.)

Fig. 55.



Before First Dressing.
February 8, 1870.

Fig. 56.



After First Dressing.
February 8, 1870.

After manipulating the foot for about one hour, as already described, the foot was dressed with ad-

[1] See Appendix.

hesive plaster and a roller, and retained in its natural position without any difficulty. (*See* Fig. 56.) Both from drawings by Dr. L. M. Yale, and both drawings made within two hours of each other.

These dressings were changed from time to time as occasion required, and, when the child was old enough to walk, a slight rubber elastic from

Fig. 57.

the outer toe of the shoe to the garter was all that was required to guide the foot to its normal position. Galvanism, friction, and shampooing were continued until the child was two years old, when the cure was complete, and remains so. (*See* Fig. 57.)

The following case shows what can sometimes be done, even in the worst form of talipes, by intelligent and persevering effort, without tenotomy, although the treatment was carried out entirely by

the father (a non-professional man) after only two practical lessons of instruction as to the principles involved in the treatment of paralytic cases:

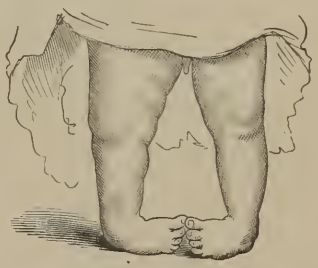
Case XVIII.—Harry Buckhout, aged one year, was sent to me on December 29, 1869, by Dr. G. W. Hodgson, of White Plains, New York, with the statement that he had been under treatment in an orthopedic institution in this city, by his advice, since he was eleven weeks old; but, finding no improvement, he had advised them to bring the child to me. He had been wearing club-foot shoes with stiff soles and an iron brace up the legs all the time, with no other result than producing a number of calosities on the feet, which were quite sore and inflamed. In consequence of the pain inflicted by the shoes, they could only be worn a very short time, and had to be removed several times a day.

As soon as the shoes were removed, and the child made to stand, the feet assumed the position as seen in Figs. 58 and 59, from photographs by O'Neil, December 29, 1869.

After manipulating the feet a short time, I found that they could be brought very nearly into their normal position without tenotomy, and, finding them to be of paralytic origin, I therefore dressed them after "Barwell's method," as previously described.

In referring to my case-book, I find the following, and the only, entry in connection with this

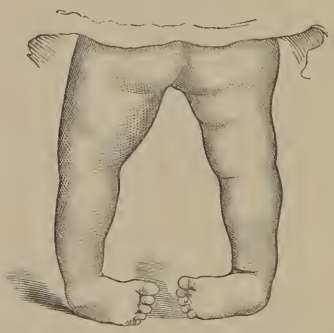
Fig. 58.



H. Buckhout, aged Twelve Months, December 29, 1869.—Anterior View.

case: "*February* 1, 1870.—Redressed; progressing

Fig. 59.



H. Buckhout, aged Twelve Months, December 29, 1869.—Posterior View.

favorably." From this time I lost sight of the case entirely, and never saw him until June 21, 1873,

when his feet were almost perfect, as will be seen in Fig. 60, from a photograph sent to me by the father with the following letter in answer to one from Dr. Hodgson inquiring as to the result of treatment in the case.

Fig. 60.

H. Buckhout, June 6, 1873.

At the second visit, February 1, 1870, the father stated that he had already spent so much money on the child that he could not afford to go on with the treatment, and I therefore took great pains to instruct him as to the application of the plaster and "rubber muscles," and also the proper manipulations to be given to the feet, and trusted to his ability to carry on the treatment.

The result is seen in Fig. 60, from a photograph sent by the father, with the following letter, dated—

"AMENIA, DUTCHESS COUNTY, *June* 10, 1873.

"DR. L. A. SAYRE—

"DEAR SIR: I send a photograph of Harry's feet, and am so proud to think you have asked for one!

"Little did I think they would ever be made so perfect! I have done just as you told me to do from the first, and have worked night and day to do it. You have acted like a father to the little fellow, and, by your skill and good treatment, they are about perfect, except a little crook in the toe.

"Gratefully yours, etc.,

"B. T. BUCKHOUT."

Had the father applied the plaster nearer the toe, the small deformity still remaining could have been easily corrected; but he simply applied it as he had seen me do it on the first visit, and made no change in his points of attachment for the artificial muscles as the cure progressed, as he should have done. As the case illustrates a very important practical point, I have thought it worth recording, to impress upon the student and physician what can be accomplished by constant care and attention, and the application of a continuous elastic force properly applied.

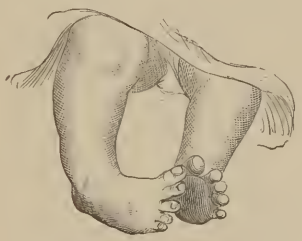
The following case, though not so great a de-

formity, illustrates the same principle of treatment, and the success that can be obtained by the constant care of non-professional attendants, if they are only properly instructed:

Case XIX.—Catherine Murtah, Susquehanna, Pennsylvania, aged seventeen days, was brought to my clinic at Bellevue Hospital in September, 1870, with congenital talipes—equino varus of both feet, of paralytic origin, as seen in Fig. 61, from photograph taken at the time by Mason, photographer to Bellevue Hospital.

After manipulating the feet a short time, and

Fig. 61.



C. M., September, 1870, aged Seventeen Days.

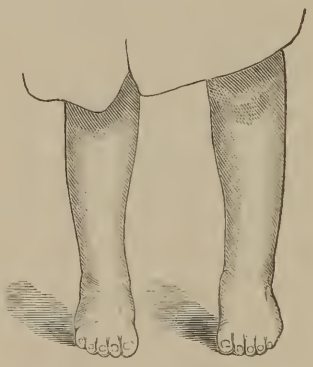
being satisfied that deformity was of paralytic origin, I dressed them with Neil's foot-board, as described, page 63, in order to show the class its mode of application.

This was used some three weeks, without any marked improvement, and "Barwell's" dressing,

with India-rubber muscles, was substituted in its place, and the mother returned with the child to her home in Pennsylvania.

The mother took entire charge of the case from this time, changing the plasters as occasion required, and moving their position according to instructions as the child's feet became more straight. The plaster and rubber muscles were worn until the child was able to walk, when she applied my

Fig. 62.



March, 1873, aged Two and a Half Years.

improved club-foot shoe, which she wore until the spring of 1873, when she was perfectly cured, as seen in Fig. 62, from photograph by O'Neil, taken March 21, 1873.

In looking over my note book, I find a number

of cases very similar to the last two here described, and that have terminated with the same fortunate result, by following the treatment above recommended; and I can, therefore, speak of it with confidence.

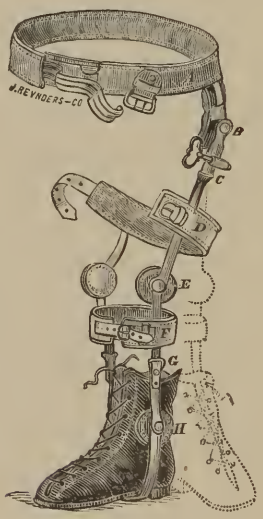
It frequently happens, in bad cases of varus and varo-equinus, that after we have restored the foot to its normal shape, either by the constant use of elastic tension, or by tenotomy of the tendo-achillis and plantar fascia combined with elastic tension, as the case may be, that the foot, although perfect in shape, cannot be held in the proper position, but will remain inverted on account of the paralysis of the rotator muscles of the thigh; and, to overcome this deformity, it becomes necessary to evert or rotate outward the entire limb.

To accomplish this object, Mr. Reynders, of 309 Fourth Avenue, New York, has recently constructed for me a shoe, with the additional attachment of a rotating screw, which fulfils the indications most completely. It is the application of the same principle which I have for so long a time used in the outward rotation of the femur in the third stage of hip-disease.

In applying this force for the outward rotation of the foot, in cases of club-feet, a light metallic rod, or shaft, is secured to the bottom of the shoe, in

front of the heel, passes up on the outer side of the limb, and connects with a well-padded pelvis-belt, having joints, of course, opposite the ankle, knee, and hip. Just below the joint, opposite the hip, the shaft is divided into two sections, and at this point is an endless screw, placed transversely to the shaft. This screw is worked by a key, and is capable of producing rotation through two-thirds of the arc of a circle. (*See* Fig. 63.)

Fig. 63.

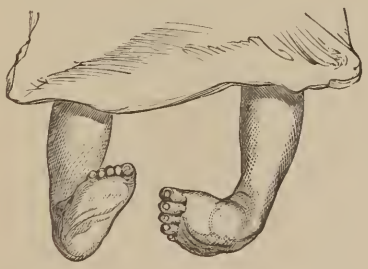


The following case, for which the instrument was constructed, illustrates not only this point, but

also another, which it seems important to bring more prominently forward, namely, the importance of commencing the treatment of this class of deformities immediately after birth, as it will be seen that the position of one of the feet was perfectly rectified in a very short time, by simply placing it in the natural position, and using proper dressings. The other foot, which had undergone structural shortening, required section of the contracted tendons and fasciæ before perfect restoration could be effected.

Case XX.—*Congenital Varo-Equinus, Left Foot; Varo-Calcaneus, Right Foot* (*as seen in annexed Drawing*, by Dr. Yale, Fig. 64).—January 2, 1874, I was called, at the request of Prof. Barker, to see the infant child of Mr. B——, Eighteenth Street, aged four days.

Fig. 64.



By manipulating his feet for half an hour or more, I was enabled to bring the right to its natural posi-

tion, and the left one nearly so, without much trouble, and to retain them in this position, with the circulation restored.

During the first efforts at restoration of the feet to their natural position, they would become ashy white, but the color would instantly return on letting them go back to their original distortion.

The *left* foot was retained in as near its normal position as it could be brought to by a single piece of adhesive plaster around the foot, drawn up on the outside of the leg and secured by a flannel roller.

The *right* foot had a piece of adhesive plaster placed on the plantar surface—drawing the heel up, and secured on the back of the leg; and another strip of plaster, to correct the varus, same as the left, and both secured by a flannel roller. No anæsthetic; no crying; no cutting.

January 4th.—Child very comfortable. Renewed dressings, with friction.

6th.—Child perfectly easy, and feet improved in position. Readjusted dressings.

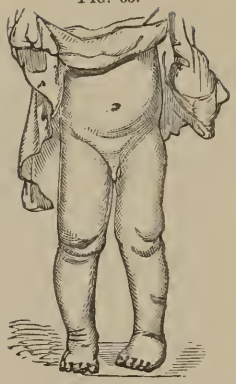
February 3d.—Dressings reapplied (same plasters being used) every two days until February 1st, when the dressings were entirely removed from the right foot, which was perfectly cured, the child voluntarily retaining it in its natural position; but the left foot gave reflex spasm on point pressure on

tendo-achillis and plantar fascia. However, on account of the removal of the child to the country, these tissues were not divided, but elastic tension was advised to be continued, in the hope of benefiting the child, and with the intention of cutting in the future, if found to be necessary; and on

December 11, 1874, finding that point pressure upon the tendo-achillis and plantar fascia, when stretched, produced reflex contractions, the same as when I saw the child nine months previous, and that no improvement had taken place during this time, although under the constant influence of an elastic tractile force, I decided that these tissues must be divided, as I had intimated would have to be done nine months before. I consequently cut the tendo-achillis and plantar fascia of the left foot, and dressed with adhesive plaster and board, as seen at page 39.

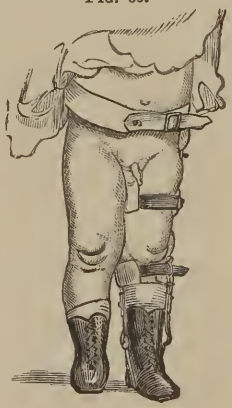
December 27th.—Result perfect, as far as form of foot is concerned; stands flat on the floor, but the foot is inverted, the whole limb being rotated inward. The child lacks the power of everting the foot or rotating the limb outward. It is easily rotated outward by the hand, and frequently, in stepping, the child will do it itself, but most of the time it remains inverted (as seen in Fig. 65); and, as he is too young to reason with, it is necessary to con-

Fig. 65.



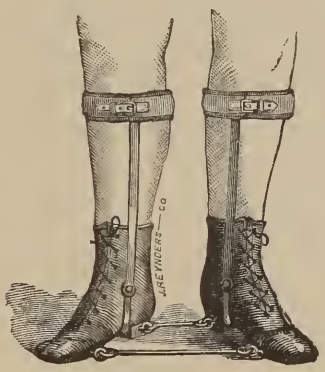
trive some plan to make the outward rotation constant; and for this purpose the instrument as seen in Fig. 63, page 118, was applied, which answers the object perfectly, the child walking quite well. (*See* Fig. 66, from photograph by O'Neil.)

Fig. 66.



Where there is only one foot involved in this deformity, the application of this rotary force to the ordinary shoe will be found of the greatest advantage; but, where both feet are implicated in the same deformity, a similar result to the above can be produced by a much simpler and more economical apparatus, although it is not quite so perfect in allowing free movements of all the parts, or so elegant in appearance. It will be found very useful for the poorer classes of patients.

Fig. 67.



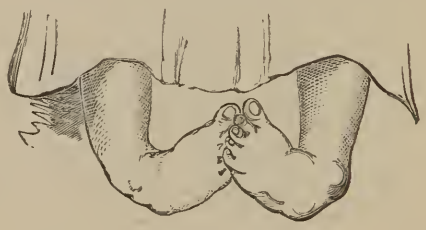
Dengler's Shoe for Inverted Feet.

It consists simply in securing the heels of a pair of common shoes together by an iron rod, with joints on each shoe, and the soles secured in the same way, with a rod a little longer than the one at

the heel, in order to evert the feet. (*See* Fig. 67.) On either side of the shoes, iron bars, jointed at the ankles, pass up to near the top of the tibia, connecting in the rear with a padded iron belt, which buckles in front. The practical use of this apparatus is well illustrated in the following case.

Case XXI.—*Congenital Double Varo-Equinus* (as seen in annexed drawing by Dr. Yale).

Fig. 68.



January 8, 1872, I saw the infant child of Mr. J. W. Pasket, of Brooklyn. Plaster dressings were applied.

October 5*th.*—Cut left tendo-achillis at Bellevue College.

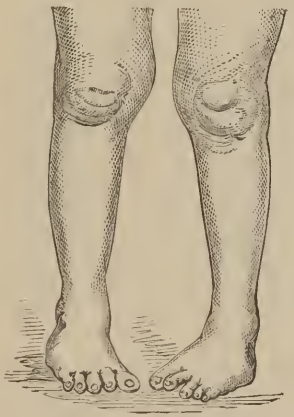
10*th.*—Heel comes down very well. There is a tense condition of the hollow of the foot, which appears to be contracted integument and condensed connective tissue only; at least the edge of the plantar fascia cannot be recognized.

19*th*.—Cut right tendo-achillis at Bellevue College.

21*st*.—Dressed with adhesive strips alone, leaving off the foot-board. The wound has entirely healed.

December 29, 1874.—Both feet were perfectly restored in form and position, the child stepping flat on the ground, but both the feet and the limbs were very strongly rotated inward (as seen

FIG. 69.



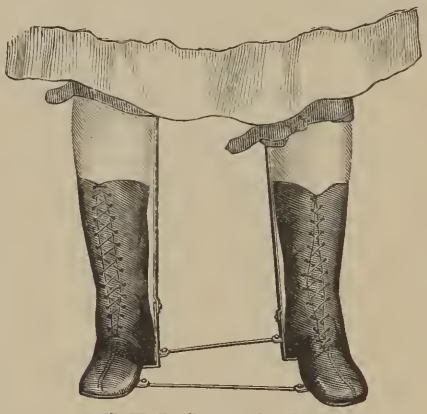
J. W. P., December 29, 1874.

in Fig. 69); and, as the parents were too poor to purchase the instrument with the rotating screw, I advised the father, who was a locksmith, to construct a pair of shoes as above described, which,

being put on the child, retained his feet in their normal position (as seen in Fig. 70).

With these shoes on, the child runs about with great activity, his steps merely being limited in length by the bars between his shoes, which compel each step to be made with an eversion of the toes in the natural direction. In all cases of double varus,

FIG. 70.



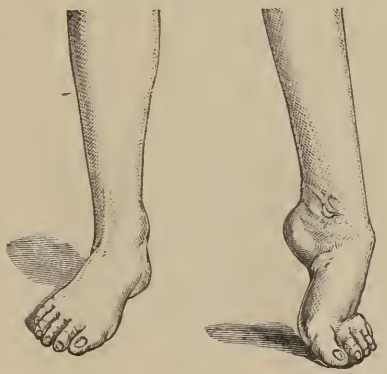
J. W. P., January 25, 1875.

with this tendency to inversion and inward rotation, in the poorer classes of patients, this simple contrivance will be found of the greatest practical utility.

The following case of extreme equinus—of a paralytic origin—is a beautiful illustration of how rapidly they sometimes recover, after being restored to proper position. (CASE XXII.)

Case XXII.—*Paralytic Equinus, with resulting Contracture of Tendo-Achillis and Plantar Fascia.*—Emma H., 14 Cottage Place, aged twelve, was a perfectly healthy child, till she was upward of three years of age. She was then suddenly attacked with paralysis of the right upper extremity and left lower extremity. In the course of three or four months,

Fig. 71.



Emma H., October 12, 1874.

the upper extremity recovered its power. The lower extremity (left) has partially recovered. It is still shorter and smaller than its fellow. The measurements are: Length, right, 29 inches; left, 28 inches. Circumference of thigh, right, 14 inches; left, 12 inches. Circumference of calf, right, 11 inches; left, 9 inches. The motions of the thigh

are perfect, and under complete control. The left foot presents an extreme case of talipes equinus (*see* Fig. 71, from photograph by O'Neil). The plantar fascia and tendo-achillis are both tense, and very tender; point pressure in each causes spasm. Owing to the distorted position of the foot, the astragalus projects markedly, as seen in the cut.

October 12, 1874.—Cut plantar fascia and tendo-achillis, and dressed with foot-board and adhesive plaster. (*See* page 39.)

Fig. 72.

Emma H., January 12, 1875.

Pressure over the scaphoid, in order to replace it, was very great, and may endanger sloughing.

Sloughing did occur, as feared, and also on the sole, beneath the heel and ball of the foot. These accidents necessitated prolonged dressings. The sores finally cicatrized completely. The present position and condition are shown in the accompanying figure (72), from photograph by O'Neil, which was taken just three months after the operation.

The foot is restored to almost perfect form; and the recovery of muscular power to flex the foot has been more rapid than in any case of the same severity that I have ever seen; and it is for that reason that I have thought it worthy of being recorded.

With one more thickness of leather on the heel and sole of the left shoe, to equalize the length of the limbs, she walks without any limp, and has no deformity that can be discovered.

APPENDIX.

Note to page 104.

I was very ill immediately after this operation, and unable to see the patient for many days. The bandages should have been removed at once, as by that means the sloughing and septicæmia which followed could have been avoided. The first time I saw her after the operation was on the 15th, when I opened the abscess over the little toe, from which time she began to recover.

Note to page 109.

Mr. Little, of London, has criticised my method of *immediate replacement* rather harshly in some of the medical journals, and uses this case as an illustration of its dangers. The simple fact that because in this case the foot was bandaged *injudiciously* tight is no evidence at all against my principles of treatment, but should only teach us the important practical lesson *never to give a patient*

an anodyne to lessen pain caused by pressure from an unduly tight band, but *immediately remove the latter* and ascertain the point of undue pressure, and so readjust your dressing as to avoid all danger of sloughing or septic poisoning. As this is the only instance of septic poisoning that I have seen in many hundreds of similar operations, I shall still continue to advocate and practise the immediate adjustment of parts to their normal position; and I feel quite confident that, if Mr. Little will review this case carefully, he will agree with me that the danger was not from the operation *per se*, but from the causes above described.

CLINICAL LECTURE

ON THE TREATMENT OF CLUB-FOOT.

DELIVERED AT BELLEVUE HOSPITAL.

In *The Medical News* of Saturday, January 14, 1882 (a weekly journal of medical science published in Philadelphia), I find one of my clinical lectures, delivered before the class at Bellevue Hospital, during the present session, on the subject of club-foot; and, as it contains nearly all the views in this book, expressed in a more concise form, I have deemed it advisable to place it as an addendum to this volume.

Gentlemen: I fear that you will think we are never going to quit the subject of club-foot, as I have already several times had occasion to lecture to you upon this matter within the past few weeks. More cases, however, continue to present themselves for treatment, and as the deformity is one which you will be called upon to remedy more frequently than almost any other, when you begin practice, I have thought we could profitably devote another hour to its consideration.

Club-foot is of such common occurrence, and, strange to say, its treatment so little understood or practiced, that I can

confidently assure you, if you will but follow the instruction which I give you for its treatment, you will be able to cure a very large proportion of the cases which are brought to you, thus reflecting great credit upon yourselves as practitioners, and will rarely have occasion to send your patients to so-called specialists. Patients are constantly being sent to me for treatment from all parts of the country—from the South, East, and West—and for the simple reason that the principles of treatment of these cases are not understood. For ten years I have been trying to inculcate these principles into the minds of physicians, but they have not yet received that general adoption by the profession which I believe they merit. So soon as they do, any one of you, or any other medical man, can relieve deformities of this kind as well as I can. There is no mystery in the treatment, and nothing about it but what you can do as well as any one else; there is no specialism in it.

Talipes Equino-varus.—This young lady is seventeen years old, and presents with a very bad case of talipes equino-varus upon the right side. You will observe that the cuboid bone is subluxated so as to form a projection. With the increasing weight of the patient, the contraction of the tendo-Achillis, and the shortening of the arch of the foot by the contraction of the tibialis anticus, the deformity has been gradually getting worse, so that she now walks upon the outer border of her little toe. Walking upon the foot in this abnormal position gives the patient great pain. She states that this deformity has existed all her life. Her case is a good illustration of the importance of following the advice which I gave some years ago, namely, that the proper time to attend to deformities of this kind is immediately after the birth of the child. As soon as you have given the mother the necessary attention after the birth of the child, and before you leave the house, you should always examine the child and see if there be any deformity present. If so, you will, by thus early beginning treatment, be able, in the great majority of cases, to restore the distorted member to its normal

position, so that, by the time the child is old enough to walk, the foot will be in proper position to receive the weight of the body, which in itself will tend to prevent the return of the deformity.

Suppose, for instance, you find a child at birth with talipes equino-varus. Ordinarily, such cases are of paralytic origin, or there may be a spasm of the muscles producing the deformity. No matter what be the cause, the deformity is the same. If of paralytic origin, it can be replaced upon the instant without the use of much force, but will often return to the abnormal position upon letting go of it. If not of paralytic origin, considerable force will have to be expended before you can restore the foot to its normal position. The replacing of the foot is accomplished by firm but gentle manipulation with the hand, crowding it toward its normal position, rotating it outward, elevating the toes and expanding the arch so as to put the plantar fascia and the tendo-Achillis upon the stretch. After doing this, you will observe that the foot becomes of a snowy whiteness, and, if you were to fix it in this position, the pressure required to keep it there would be so great that it would deprive the parts pressed upon of their nutrition, and there would be sloughing. Hence, after you have held the foot in its rectified position for a few seconds, you should let go your hold of it and allow the blood to return. As soon as the circulation has been restored, you should go through the same manœuvre again, this time holding the foot in the improved position a little longer, or until it becomes whitened, and then let go of it. If the case be one of double talipes equino-varus, after you have replaced one foot and let go of it, take the other and repeat the process with that. By the time you have reduced the deformity in the second foot, the circulation in the first will have been restored, and it can be again replaced as before. This process should be repeated twenty, forty, or a hundred times, as the case may be, until you can restore the foot nearly, or quite, to its normal position without the use of much force. After you have done this, you should ascertain to what extent

the deformity can be rectified without interfering with the nutrition of the foot—without the foot becoming whitened—and secure it in this position with a roller-bandage and a strip of adhesive plaster. If you can completely rectify the deformity without the foot losing its normal color, it will be safe to secure it in its natural position. Unless this can be readily accomplished, however, do not try to correct the deformity completely at that particular sitting. The leg of an infant should be first protected with a roller-bandage of flannel before applying the adhesive strip, otherwise there would be danger of excoriation of the skin. The adhesive strip is placed with one end on the dorsum of the foot, then carried to the inside, underneath, and to the outside of the foot and up the leg. Sufficient tension is put upon the adhesive strip to draw the foot into as nearly a normal position as possible, compatible with the free circulation of blood within it. It is then secured in this position with a few turns of a roller-bandage. The foot should be submitted to repeated daily manipulations while the bandage is yet applied. When the bandage is removed, which should be done every one, two, or three days, as the case may be, the parts should be washed with alcohol-and-water, the foot restored to its normal position several times, and then retained as nearly as possible in this position with a roller bandage. After a time you can mould a piece of leather to the foot, by first making it pliable by dipping in cold water. Or a very convenient method of accomplishing this is to take one of those little wooden models of a foot and leg of about the size of that of your patient, such as are used by ladies to place inside of stockings to facilitate darning them, and mould the leather over this, securing it in position with a bandage, and allowing it to dry, after which it can be applied to the foot; or after the foot and leg have been properly protected by a smoothly applied flannel roller it can be covered with a plaster-of-Paris bandage, and held in the proper position until the plaster has set. You continue to rectify the deformity in this way until the child is able voluntarily to hold the foot in its normal position. As

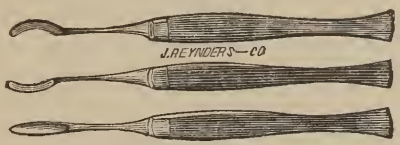
soon as the child begins to walk, the weight of its body will help to keep the foot from being displaced, and will complete the cure.

If the deformity is not corrected before the child begins to walk, pressure upon the foot in its abnormal position will intensify the deformity, and that which was at first a very slight and easily-rectified abnormality becomes painful and difficult to cure. Pressure upon parts not provided with protective cushions gives rise to the formation of bursæ upon the outer margin of the foot. Further neglect may result in excoriations and sores, producing an inflammatory action, followed by reflex contraction of the muscles, which in turn, owing to their constant irritation, become structurally changed —shortened: *contractured.* When these changes have taken place, and the fibrillæ have become adherent one to another, no amount of power short of severing the diseased tissues will enable you to rectify the deformity. They must either be ruptured or divided, or, what is better, make subcutaneous section of them. Now, how are you to determine whether a muscle be contracted or contractured? To do this, bring the foot into as nearly a normal position as possible, and then apply point pressure to the part thus put upon the stretch; if reflex spasm is produced, the tendon, fascia, or muscles pressed upon are contractured, and require section in order that the deformity may be rectified.

You observe in the case of this young lady, when I put the plantar fascia upon the stretch, point pressure produces reflex spasm. The same is true of the tendo-Achillis. The inference then is, that it is useless to make any attempt to straighten this foot without first dividing the contractured tissues. As the operation is accompanied with considerable pain, it will be necessary to anæsthetize the patient. In doing this it is always essential to have the clothes loosened, so as not to interfere with the respiration. The lesson to be learned from this case is that whenever you make section of tendon, fascia, or muscle, for the relief of deformity, on that instant restore the foot to its normal position. By thus sep-

arating the ends of the divided tissue to the extent required for the correction of the deformity, a space—vacuum—will be left, into which exudation will take place, and the exuded material will rapidly become organized. The old plan was to delay rectifying the deformity after the contractured tissues had been divided until the external wound had entirely closed and the inflammatory action which may follow the operation had subsided. Mechanical force was then applied, and the newly-organized material exuded between the ends of the divided tissues was stretched until the foot was brought into its proper position. This stretching process was always very painful, and kept up a constant irritation, frequently resulting in inflammation and suppuration. Even after the foot was brought into its place, if the mechanical appliances were

Fig. 1.



removed, it was very apt to flop back into its old position, owing to the want of power on the part of the muscles to retain it where it should be.

In regard to the knife to be used in the subcutaneous section of tissues, it is exceedingly important that it possess certain peculiarities. The handle should be so marked that you can always determine the direction of the cutting edge, though the blade be deeply buried in the tissues. The shank should be strong and well set in the handle. The blade, which should be about three-quarters of an inch in length, and either curved or straight, should be made very thick at the "back," and always rounded on the end. Most instrument-makers make their tenotomes sharp-pointed, and those surgeons who use them run great risk of dividing arteries or veins, or puncturing nerves. Fig. 1 represents three varieties

of tenotomes made by Messrs. Reynders & Co., of this city, for me. That which has its cutting edge upon the convexity of the blade is the one which I use almost exclusively.

I will now divide the plantar fascia, and as I do so, the part being put upon the stretch, I can hear the snapping of the fibres and plainly feel them giving way. As the knife is withdrawn, and without a drop of blood having escaped, I place a small bit of adhesive plaster over the wound, thus effectually shutting out all air. Next I will divide the tendo-Achillis. You introduce your knife flatwise, and in such a manner as to make a valvular incision through the skin. The blade of the knife, still kept flatwise, is carried beneath the tendon to the opposite side, when it is turned with its cutting edge toward the tendon. The tendon is now pressed down upon the knife, while at the same time a moderate sawing motion is given to the blade until the tissues are divided. As my knife is passing through the tendon, you can hear a squeaking noise, and now, a sudden snap, indicating that the tendon is completely divided. Upon withdrawing my knife, I place a piece of adhesive plaster, as before, over the site of the incision, and then proceed, by manual pressure, to bring the foot into its normal position.

We are now ready for the application of the foot-board. The foot-board which I shall use in this case, and would recommend to you in all similar cases, is of very simple construction. It consists of a thin piece of board, an inch or so longer than the foot, shaped somewhat like the sole of a shoe, but made narrow at the heel and broad at the toes. A strip of adhesive plaster, about an inch or an inch and a half wide, and long enough to pass over the instep and down underneath the board again, is placed with its middle part against the heel of the board, and a longer and broader strip of adhesive plaster, placed lengthwise of the board, beginning at the toe-end underneath, is passed back over the heel to the underside of the board and brought forward to the toe-end. The board is now padded, under the adhesive plaster, with cotton on the side which is to be placed against the sole of

the foot. A firm bandage is applied over the adhesive plaster, and holds everything in place. The board is now ready for use. The malleoli and other bony prominences are protected from undue pressure by a liberal use of cotton secured in position by a bandage, and the board is placed in position upon the foot. The foot is first brought to a right angle with the leg, and the two ends of the heel-strap are then brought forward, crossed over the instep, and passed to the underside of the board. It is necessary that the foot be placed at right angles to the leg before this is done, otherwise there would be danger of obstructing the circulation by making undue pressure with the adhesive strap. The foot is now securely fastened to the board by a roller-bandage. The next step is to bring the broad strip of adhesive plaster attached to the toe-end of the board up against the front part of the leg, making sufficient traction upon it to retain the foot at a right angle to the leg. It is then secured with a few turns of the roller-bandage, and the dressing is complete. Sometimes it is necessary to have an additional strip of adhesive plaster extending from the inside or outside of the foot to a position upon the leg, according to whether the foot is turned to the outside or inside. This dressing is much simpler than Stromeyer's foot-board, is inexpensive, and fulfils all the indications to be met. No complicated or expensive apparatus is required. The most important and most difficult part of the whole dressing to procure is a good quality of adhesive plaster.*

The same principles which have been applied to this are applicable to any other form of club-foot. Of course, you will not be able to relieve all cases, but, the earlier you begin treatment, the better will be your chances of effecting a cure. It is sometimes very difficult to restore the function of the muscle. Very often, if the case be left until adult life, the

* This case was discharged at the end of six weeks from the hospital without deformity, and able to flex the foot voluntarily to more than a right angle. Was exhibited before the class, December 14, 1881, before leaving the hospital.

bones of the foot will have become so altered that it will be impossible by this means to rectify the abnormalities of bony structure. Thanks, however, to the efforts of Prof. Lister, we are now able to deal very successfully even with this class of cases. Under the antiseptic spray we can cut directly down upon the bone with perfect freedom and safety, remove a wedge-shaped piece, and restore the foot to its normal position, an operation which only a few years ago was entirely impracticable.

Talipes Equino-varus.—Section of Plantar Fascia and Tendo-Achillis.—Hudson's Shoe.—Rapid Progress toward Recovery.—I merely asked this little girl to come to the clinic to-day in order that you might see how rapidly these deformities can be rectified. The deformity which existed was a perfect duplicate of that of the young lady which you have just seen. The only difference between the two cases is the age of the patients—this one being seven years old, and the young lady seventeen. It lacks two days of being three weeks since I operated on this little girl. She is now able, as you see, to stand with her heel upon the floor. I operated upon her in exactly the same way as I have upon the young lady—making section of the plantar fascia and tendo-Achillis subcutaneously, and dressing the foot in the manner I have already shown you. At the time of the operation there was no loss of blood whatever. The healing of the wound was completed without the formation of a drop of pus, and after ten days she was able to make traction with her tendo-Achillis; but she could not, nor can she now, voluntarily flex her foot, on account of the paralysis of the muscles on the front part of the leg. Having rectified the deformity, we have now to cure the disease, namely, the paralysis of the muscle. Do not make the mistake of thinking that when you have reduced the deformity you have cured the disease. Not until the function of the muscles has been restored to such an extent that they hold the foot in its normal position should the case be discharged as cured. To this end the muscles should have the benefit of daily massage and the application of electricity.

The injection of a solution containing one-eightieth of a grain of strychnia, directly into the paralyzed muscles, is often of considerable service in restoring them to their function. This can be done by means of a hypodermic syringe, and may be repeated every ten, twenty, or thirty days, according to circumstances, until the muscles have recovered their power, and the foot is held in its normal position by them without other mechanical aid. Until then no cure has been effected.

This little girl you see is wearing a shoe (see Fig. 2), to the sole of which are fastened two iron rods jointed at the ankle

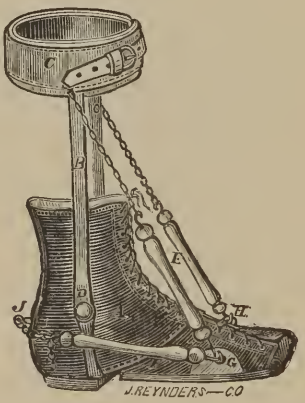
Fig. 2.

and running up on either side of the leg to the top of the tibia. At the upper end a padded band encircles the leg, and to this are fastened little hooks, to which, in turn, are attached India-rubber muscles, which pass downward on each side of the leg. The lower end of each of these rubber muscles is furnished with a piece of strong catgut, which plays over a semicircular wheel opposite the ankle-joint. By this means any amount of tension can be exerted upon the foot, and it can thus be readily kept in its normal position. I used to have a shoe constructed with a stirrup over the toes, to which was attached an elastic strap, extending up to the band encircling the leg just below the knee. But Dr. Hudson has devised this shoe, which I consider a very great improvement upon mine.

Talipes Equino-varus.—Here is another case of talipes equino-varus. The deformity is apparently so slight that most persons would think that no operation would be required. I see that the girl is wearing what pretends to be one of my club-foot shoes (see Fig. 3); but, on account of its faulty construction, it is of no service whatever.

The lateral movement, so important to these cases, is entirely prevented, owing to the fact that the part of the sole adjacent to the heel has not been properly made; hence the

Fig. 3.



elastic side-straps are prevented from acting. This difficulty can easily be rectified by rounding off the inner and outer corners of the sole next to the heel, so as to allow full play of the orbicular joint, opposite the medio tarsal articulation. The shoe is of such simple construction that any intelligent blacksmith, in any part of the country, could readily make it. The late Prof. Crosby devised a very serviceable and cheap substitute for my shoe in the following manner: Taking a pair of stout shoes that fitted the patient, he cut the sole of the one for the deformed foot directly in two, at a point opposite the medio-tarsal junction; the two parts were

made fast to each other by means of links of a chain, and the necessary inversions or eversions produced by elastic straps.

Upon a careful examination of this patient, I find that no shoe will do her any good until an operation is performed, because the muscles and fascia have become contractured. Now, observe what takes place when I press upon the plantar fascia, after it has been put upon the stretch. You see, there is a reflex spasm; the same is true with the tendo-Achillis. Hence, I shall proceed to operate in this case as I have done in the other.

In the course of a few weeks she will be able to put on the club-foot shoe, which she will wear with advantage. Electricity, massage, and the cold-water douche, should be employed to complete a cure.

One word in regard to the application of electricity in these cases. Before applying it, the deformity should be reduced, as far as possible, by means of manipulation with the hands, so that, when the muscles are caused to contract by the application of electricity, they should be placed in the most advantageous position possible. If you have no battery at hand, you can cause vigorous contraction of the muscles by taking them up between your thumb and fingers, and giving them a sharp, quick pinch. Here, in this case, you see this shows very plainly; every time I pinch the muscles of the leg, you see the foot is drawn up.*

* Returned at end of two weeks, when tendo-Achillis was firmly united, so that she could voluntarily extend the foot. One month later, was shown to class perfectly restored, and wearing ordinary shoe.

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